

NEET-UG & AIPMT

Objective Test Papers of Previous 10 Years



Contents

1.	YEAR – 2022	1-106
*	Test Paper - Re-NEET(UG)	1-26
*	Answer Key / Hint / Solution	27-34
*	Test Paper - NEET(UG) (OVERSEAS)	35-59
*	Answer Key / Hint / Solution	60-70
*	Test Paper - NEET(UG)	71-97
*	Answer Key / Hint / Solution	98-106
2.	YEAR – 2021	107-162
*	Test Paper - NEET(UG) (PAPER-2)	107-123
*	Answer Key / Hint / Solution	124-130
*	Test Paper - NEET(UG)	131-152
*	Answer Key / Hint / Solution	153-162
3.	YEAR – 2020	163-208
*	Test Paper - NEET(UG) Covid-19	163-180
*	Answer Key / Hint / Solution	181-186
*	Test Paper - NEET(UG)	187-202
*	Answer Key / Hint / Solution	203-208
4.	YEAR – 2019	209-258
*	Test Paper - NEET(UG) Odisha	209-225
*	Answer Key / Hint / Solution	226-232
*	Test Paper - NEET(UG)	233-250
*	Answer Key / Hint / Solution	251-258

NEET-UG & AIPMT

Objective Test Papers of Previous 10 Years



Contents

5.	YEAR – 2018	259-284
	* Test Paper - NEET(UG)	259-276
	* Answer Key / Hint / Solution	277-284
6.	YEAR – 2017	285-308
	* Test Paper - NEET(UG)	285-300
	* Answer Key / Hint / Solution	301-308
7.	YEAR – 2016	309-352
	* Test Paper (NEET-II)	309-323
	* Answer Key / Hint / Solution	324-330
	* Test Paper (NEET-I)	331-345
	* Answer Key / Hint / Solution	346-352
8.	YEAR – 2015	353-404
	* Test Paper (RE-AIPMT)	353-367
	* Answer Key / Hint / Solution	368-376
	* Test Paper (AIPMT)	377-393
	* Answer Key / Hint / Solution	394-404



NEET-UG & AIPMT



Objective Test Papers of Previous 10 Years

Contents

9.	YEAR – 2014	405-428
*	Test Paper (AIPMT)	405-420
*	Answer Key / Hint / Solution	421-428
10.	YEAR – 2013	429-451
*	Test Paper (NEET-UG)	429-444
*	Answer Key / Hint / Solution	445-450

© All rights including trademark and copyrights and rights of translation etc. reserved and vested exclusively with **Allen Career Institute Pvt. Ltd.®**. No part of this publication may be copied, reproduced, adapted, abridged or translated, stored in any retrieval system, computer system, photographic or other system or transmitted in any form or by any means whether electronic, mechanical, digital, optical, photocopying, recording or otherwise, or stored in any retrieval system of any nature. Any breach will entail legal action and prosecution without further notice.

This study material is sold/distributed by Allen Career Institute Pvt. Ltd.® subject to the condition and undertaking given by the student that all proprietary rights (as defined under the Trademark Act, 1999 and Copyright Act, 1957) of the Study Materials and/or Test Series and/or the contents shall belong to Allen Career Institute's Tests and neither the Study Materials and/or Test Series and/or the contents nor any part thereof shall be reproduced, modify, re-publish, sub-license, upload on website, broadcast, post, transmit, disseminate, distribute, sell in market, stored in a retrieval system or transmitted in any form or by any means for reproducing or making multiple copies of it. Any violation or infringement of the propriety rights of Allen shall be specifically punishable under Section- 29 & 52 of the Trademark Act, 1999 and under Section- 51, 58 & 63 of the Copyright Act, 1957 and any other Act applicable in India. All disputes are subjected to the exclusive jurisdiction of courts, tribunals and forums at Kota, Rajasthan only.

Note:- Due care and diligence has been taken while editing and printing this book/study materials. Allen Career Institute Pvt. Ltd.® shall not hold any responsibility for any mistake that may have inadvertently crept in. Allen Career Institute Pvt. Ltd.® shall not be liable for any direct, consequential or incidental damages arising out of the use of this book.

[Based on Test Papers of Previous]

PHYSICS

S. Topic No.	2013	2014	2015	2015 (Re)	2016 NEET-I	2016 NEET-II	2017 NEET (UG)	2018 NEET (UG)	2019 NEET (UG)	2019 Odisha	2020 NEET (UG)	2020 NEET (UG) (Covid-19)	2021 NEET (UG)	2021-(2) NEET (UG)	2022 NEET (UG) (Overseas)	2022 Re-NEET (UG)	Total
1 Modern Physics	5	6	5	4	4	4	4	4	3	4	7	5	5	4	5	5	80
2 Thermal Physics (Thermal Expansion, Calorimetry, Heat Transfer, KTG & Thermodynamics)	6	5	6	5	6	5	5	5	4	4	5	5	2	4	2	3	75
3 Current Electricity and Effect of Current	3	4	3	3	2	2	2	4	3	2	5	4	4	3	4	4	56
4 Semiconductor and Digital Electronics	3	2	2	2	3	3	3	3	2	2	3	4	3	3	3	3	47
5 Magnetic Effect of Current and Magnetism	3	2	2	2	3	3	3	2	3	3	2	1	4	3	4	4	47
6 Ray Optics and Optical Instruments	2	2	2	2	3	3	2	3	4	2	1	4	3	3	2	2	43
7 Rotational Motion	2	2	3	2	2	3	3	4	2	1	1	1	2	2	1	1	34
8 Electrostatics	2	2	1	1	1	1	2	1	3	2	3	3	4	1	3	2	35
9 Gravitation	2	2	1	2	2	2	2	2	2	3	1	1	2	1	2	1	29
10 Kinematics	2	2	2	2	2	1	2	1	2	3	1	1	3	2	3	2	34
11 Wave Motion and Doppler's Effect	3	3	1	2	3	2	2	2	0	1	1	1	0	2	1	1	26
12 Properties of matter and Fluid Mechanics	2	2	2	3	1	2	2	2	3	3	2	2	1	2	3	2	37
13 Wave Optics (Nature of Light, Interference, Diffraction & Polarization)	2	2	2	2	2	2	3	2	1	2	3	1	1	2	1	2	32
14 Alternating Current	1	0	1	1	2	3	0	1	0	2	2	1	2	1	2	3	23
15 Laws of Motion and Friction	2	3	2	1	0	0	1	2	1	2	1	1	1	2	0	3	24
16 Electromagnetic Induction	1	2	1	1	1	1	2	1	2	1	0	2	2	2	2	1	24
17 Collisions and Centre of Mass	1	1	2	3	0	3	0	1	1	2	1	1	0	1	2	1	21
18 Oscillations (SHM, Damped and Forced Oscillations & Resonance)	0	1	2	1	0	1	2	1	3	1	1	1	2	1	1	2	21
19 Unit, Dimension & Measurements	1	1	1	1	0	1	1	1	1	1	3	1	3	1	4	3	26
20 Circular Motion	0	0	0	1	4	1	1	1	3	1	0	1	0	1	0	0	15
21 Work, Energy & Power	1	0	3	1	1	1	1	0	1	1	0	0	2	2	1	1	17
22 EM Waves	1	0	0	1	1	0	1	1	1	1	1	2	2	0	2	1	17
23 Capacitors	0	1	1	1	1	1	1	1	0	1	1	1	2	1	1	2	17
24 Basic Mathematics & Vectors	0	0	0	1	1	0	0	0	0	0	0	1	0	1	0	1	5
Total	45	45	45	45	45	45	45	45	45	45	45	45	50	45	50	50	785

[Based on Test Papers of Previous



BIOLOGY

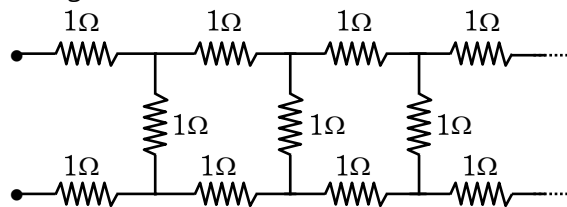
S. No.	Topic	2013	2014	2015	2015 (Re)	2016 NEET-I	2016 NEET-II	2017 NEET (UG)	2018 NEET (UG)	2019 NEET (UG)	2019 Odisha	2020 NEET (UG)	2020 NEET (UG) (Covid-19)	2021 NEET (UG)	2021-(2) NEET (UG)	2022 NEET (UG) (Overseas)	2022 Re-NEET (UG)	Total
1	Principle of inheritance, Biotechnology, Molecular basis of inheritance, Biomolecules, Mutation, Microbes (Genetics)	16	12	13	16	15	15	18	17	21	22	20	20	28	18	25	22	323
2	Ecology, Demography	11	10	12	11	12	11	7	11	8	8	8	10	9	10	12	12	173
3	Plant Physiology	8	6	7	6	6	9	10	7	8	10	9	9	8	12	13	14	158
4	Plant Diversity	5	16	6	7	7	7	6	8	6	6	4	5	6	6	5	5	111
5	Cell, Cell division	6	6	9	8	9	6	4	5	7	5	6	7	9	7	7	6	114
6	Animal Embryology and Reproductive System	5	5	5	5	6	6	4	5	4	4	5	5	5	4	5	5	83
7	Life History of Angiosperm (Reproduction in Plants)	7	4	5	7	4	5	7	5	4	3	3	3	4	3	4	1	74
8	Plant Morphology, Modification, Families	2	5	4	4	7	4	4	2	1	3	3	3	2	5	3	3	59
9	Immunity, Disease, Biomedical Technique, Drug Addiction, Mental Health	2	3	4	3	3	2	3	3	5	3	3	2	4	3	2	3	50
10	Animal Diversity	5	3	4	3	3	2	3	4	2	2	4	4	4	4	2	3	54
11	Origin & Evolution	5	2	2	2	3	4	2	3	4	3	4	4	2	1	2	2	47
12	Plant Anatomy / Tissues	3	2	2	1	0	2	3	4	3	2	2	2	3	2	3	3	39
13	Endocrine System	3	3	1	2	2	4	3	2	2	3	3	2	1	1	2	1	37
14	Strategies for enhancement in food production (Plant breeding + Animal breeding)	1	1	2	3	2	3	2	0	1	2	1	1	3	1	1	2	28
15	Digestive System, Vitamins, Nutritional Imbalance	1	2	2	2	2	1	3	2	2	2	2	2	2	3	2	2	34
16	Skeletal System & Muscles	3	2	2	2	1	2	1	1	2	2	1	1	3	1	2	2	29
17	Animal Respiratory System	1	1	1	1	3	2	1	3	2	2	2	2	2	2	2	2	31
18	Animal Tissues	0	3	2	1	1	1	2	0	1	1	4	1	1	2	3	3	29
19	Circulatory System	2	1	2	2	1	1	1	2	2	2	2	1	2	0	2	1	26
20	Excretory System	1	1	2	1	1	1	1	2	2	2	2	2	0	2	1	1	23
21	Earthworm and Cockroach \ Frog	1	0	0	1	1	1	2	1	1	1	1	2	2	1	1	2	19
22	Nervous System	1	1	2	1	0	0	2	2	1	1	0	1	0	1	1	0	15
23	Receptors (Eye, Ear, Nose)	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	14
TOTAL		90	90	90	90	90	90	90	90	90	90	90	90	100	90	100	100	1570

NEET(UG) – 2022 (RE-EXAMINATION)

Physics : Section-A (Q. No. 1 to 35)

- Identify the function which represents a non-periodic motion.
 - (1) $e^{-\omega t}$
 - (2) $\sin \omega t$
 - (3) $\sin \omega t + \cos \omega t$
 - (4) $\sin(\omega t + \pi/4)$
- The magnetic field of a plane electromagnetic wave is given by
 $\vec{B} = 3 \times 10^{-8} \cos(1.6 \times 10^3 x + 48 \times 10^{10} t) \hat{j}$
 then the associated electric field will be :
 - (1) $3 \times 10^{-8} \cos(1.6 \times 10^3 x + 48 \times 10^{10} t) \hat{i} \text{ V/m}$
 - (2) $3 \times 10^{-8} \sin(1.6 \times 10^3 x + 48 \times 10^{10} t) \hat{i} \text{ V/m}$
 - (3) $9 \sin(1.6 \times 10^3 x - 48 \times 10^{10} t) \hat{k} \text{ V/m}$
 - (4) $9 \cos(1.6 \times 10^3 x + 48 \times 10^{10} t) \hat{k} \text{ V/m}$
- The incorrect statement about the property of a Zener diode is :-
 - (1) Zener voltage remains constant at breakdown
 - (2) It is designed to operate under reverse bias
 - (3) Depletion region formed is very wide
 - (4) p and n regions of zener diode are heavily doped
- A cell of emf 4 V and internal resistance 0.5Ω is connected to a 7.5Ω external resistance. The terminal potential difference of the cell is :-
 - (1) 3.75 V
 - (2) 4.25 V
 - (3) 4 V
 - (4) 0.375 V
- Given below are two statements :
Statement-I :
 In an ac circuit, the current through a capacitor leads the voltage across it.
Statement-II :
 In a.c. circuits containing pure capacitance only, the phase difference between the current and the voltage is π :-
 In the light of the above statements, choose the most appropriate answer from the options given below:
 - (1) Both **statement-I** and **statement-II** are correct
 - (2) Both **statement-I** and **statement-II** are incorrect
 - (3) **Statement-I** is correct but **statement-II** is incorrect
 - (4) **Statement-I** is incorrect but **statement-II** is correct

- The equivalent resistance of the infinite network given below is :

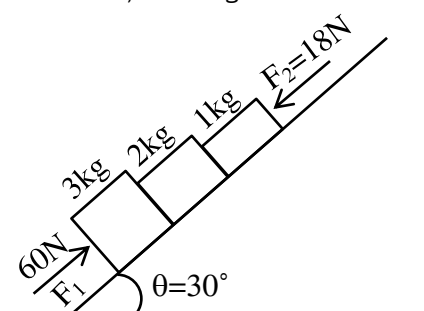


- (1) 2Ω
 - (2) $(1 + \sqrt{2}) \Omega$
 - (3) $(1 + \sqrt{3}) \Omega$
 - (4) $(1 + \sqrt{5}) \Omega$
- A cricket ball is thrown by a player at a speed of 20 m/s in a direction 30° above the horizontal. The maximum height attained by the ball during its motion is : ($g = 10 \text{ m/s}^2$)
 - (1) 5 m
 - (2) 10 m
 - (3) 20 m
 - (4) 25 m
- A closely packed coil having 1000 turns has an average radius of 62.8 cm. If current carried by the wire of the coil is 1 A, the value of magnetic field produced at the centre of the coil will be (permeability of free space = $4\pi \times 10^{-7} \text{ H/m}$) nearly:
 - (1) 10^{-1} T
 - (2) 10^{-2} T
 - (3) 10^2 T
 - (4) 10^{-3} T
- An inductor of inductance 2 mH is connected to a 220 V, 50 Hz a.c. source. Let the inductive reactance in the circuit is X_1 . If a 220 V dc source replaces the ac source in the circuit, then the inductive reactance in the circuit is X_2 . X_1 and X_2 respectively are :
 - (1) 6.28 Ω , zero
 - (2) 6.28 Ω , infinity
 - (3) 0.628 Ω , zero
 - (4) 0.628 Ω , infinity
- During a cloudy day, a primary and a secondary rainbow may be created, then the :
 - (1) primary rainbow is due to double internal reflection and is formed above the secondary one.
 - (2) primary rainbow is due to double internal reflection and is formed below the secondary one.
 - (3) secondary rainbow is due to double internal reflection and is formed above the primary one.
 - (4) secondary rainbow is due to single internal reflection and is formed above the primary one.

11. The light rays having photons of energy 4.2 eV are falling on a metal surface having a work function of 2.2 eV. The stopping potential of the surface is :

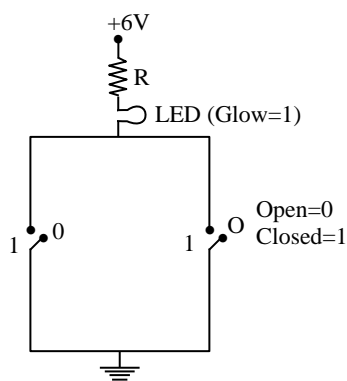
(1) 2 eV (2) 2 V (3) 1.1 V (4) 6.4 V

12. In the diagram shown, the normal reaction force between 2 kg and 1 kg is (Consider the surface, to be smooth): Given $g = 10 \text{ ms}^{-2}$



(1) 25 N (2) 39 N (3) 6 N (4) 10 N

- 13.



Identify the equivalent logic gate represented by the given circuit :

(1) OR (2) NOR (3) AND (4) NAND

14. Two copper vessels A and B have the same base area but of different shapes. A takes twice the volume of water as that B requires to fill upto a particular common height. Then the correct statement among the following is:

(1) Pressure on the base area of vessels A and B is same.
 (2) Pressure on the base area of vessels A and B is not same.
 (3) Both vessels A and B weigh the same.
 (4) Vessel B weighs twice that of A.

15. The distance between the two plates of a parallel plate capacitor is doubled and the area of each plate is halved. If C is its initial capacitance, its final capacitance is equal to:

(1) $2C$ (2) $C/2$ (3) $4C$ (4) $C/4$

16. The terminal velocity of a copper ball of radius 5 mm falling through a tank of oil at room temperature is 10 cm s^{-1} . If the viscosity of oil at room temperature is $0.9 \text{ kg m}^{-1} \text{ s}^{-1}$, the viscous drag force is :

(1) $8.48 \times 10^{-3} \text{ N}$ (2) $8.48 \times 10^{-5} \text{ N}$
 (3) $4.23 \times 10^{-3} \text{ N}$ (4) $4.23 \times 10^{-6} \text{ N}$

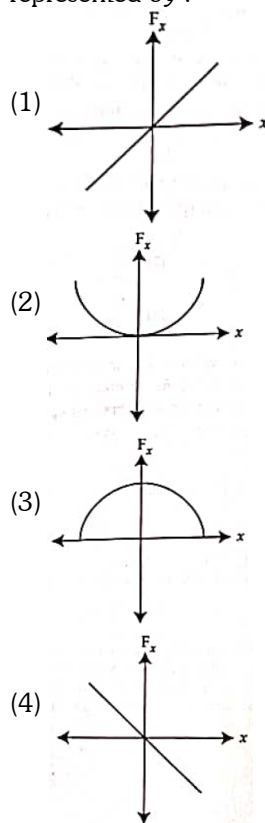
17. If $\vec{F} = 2\hat{i} + \hat{j} - \hat{k}$ and $\vec{r} = 3\hat{i} + 2\hat{j} - 2\hat{k}$, then the scalar and vector products of \vec{F} and \vec{r} have the magnitudes respectively as :

(1) 5, $\sqrt{3}$ (2) 4, $\sqrt{5}$ (3) 10, $\sqrt{2}$ (4) 10, 2

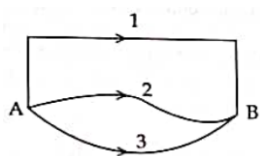
18. After passing through a polariser a linearly polarised light of intensity I is incident on an analyser making an angle of 30° with that of the polariser. The intensity of light emitted from the analyser will be :

(1) $\frac{I}{2}$ (2) $\frac{I}{3}$ (3) $\frac{3I}{4}$ (4) $\frac{2I}{3}$

19. The restoring force of a spring with a block attached to the free end of the spring is represented by :



20. If the screen is moved away from the plane of the slits in a Young's double slit experiment, then the :
- angular separation of the fringes increases
 - angular separation of the fringes decreases
 - linear separation of the fringes increases
 - linear separation of the fringes decreases
21. The effective capacitances of two capacitors are $3\mu\text{F}$ and $16\mu\text{F}$, when they are connected in series and parallel respectively. The capacitance of two capacitors are :
- $10\mu\text{F}$, $6\mu\text{F}$
 - $8\mu\text{F}$, $8\mu\text{F}$
 - $12\mu\text{F}$, $4\mu\text{F}$
 - $1.2\mu\text{F}$, $1.8\mu\text{F}$
22. The distance covered by a body of mass 5 g having linear momentum 0.3 kg m/s in 5 s is:
- 300 m
 - 30 m
 - 3 m
 - 0.3 m
23. A gravitational field is present in a region and a mass is shifted from A to B through different paths as shown. If W_1 , W_2 and W_3 represent the work done by the gravitational force along the respective paths, then :



- $W_1 = W_2 = W_3$
 - $W_1 > W_2 > W_3$
 - $W_1 > W_3 > W_2$
 - $W_1 < W_2 < W_3$
24. The reciprocal of resistance is :
- reactance
 - mobility
 - conductivity
 - conductance

25. Given below are two statements : one is labelled as Assertion (A) and the other is labelled as Reason (R),

Assertion (A) :

When a fire cracker (rocket) explodes in mid air, its fragments fly in such a way that they continue moving in the same path, which the fire cracker would have followed, had it not exploded


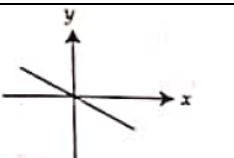
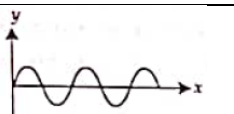
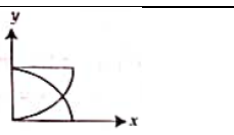
Reason (R) :

Explosion of cracker (rocket) occurs due to internal forces only and no external force acts for this explosion.

In the light of the above statements, choose the most appropriate answer from the options given below :

- Both (A) and (R) are correct and (R) is the correct explanation of (A)
 - Both (A) and (R) are correct but (R) is not the correct explanation of (A)
 - (A) is correct but (R) is not correct
 - (A) is not correct but (R) is correct
26. The threshold frequency of a photoelectric metal is ν_0 . If light of frequency $4\nu_0$ is incident on this metal, then the maximum kinetic energy of emitted electrons will be :
- $h\nu_0$
 - $2h\nu_0$
 - $3h\nu_0$
 - $4h\nu_0$
27. The ratio of the magnitude of the magnetic field and electric field intensity of a plane electromagnetic wave in free space of permeability μ_0 and permittivity ϵ_0 is (Given that c – velocity of light in free space)
- c
 - $\frac{1}{c}$
 - $\frac{c}{\sqrt{\mu_0\epsilon_0}}$
 - $\frac{\sqrt{\mu_0\epsilon_0}}{c}$
28. The shape of the magnetic field lines due to an infinite long, straight current carrying conductor is:
- a straight line
 - circular
 - elliptical
 - a plane

29. Match List – I with List – II :

	List – I (x-y graphs)		List-II (Situations)
(a)		(i)	Total mechanical energy is conserved
(b)		(ii)	Bob of a pendulum is oscillating under negligible air friction
(c)		(iii)	Restoring force of a spring
(d)		(iv)	Bob of a pendulum is oscillating along with air friction

Choose the **correct** answer from the options given below :

- (1) (a) - (iv), (b) - (ii), (c) - (iii), (d) - (i)
 (2) (a) - (iv), (b) - (iii), (c) - (ii), (d) - (i)
 (3) (a) - (i), (b) - (iv), (c) - (iii), (d) - (ii)
 (4) (a) - (iii), (b) - (ii), (c) - (i), (d) - (iv)

30. Given below are two statements :

Statement I :

The law of radioactive decay states that the number of nuclei undergoing the decay per unit time is inversely proportional to the total number of nuclei in the sample.

Statement II :

The half life of a radionuclide is the sum of the life time of all nuclei, divided by the initial concentration of the nuclei at time $t = 0$.

In the light of the above statements, choose the most appropriate answer from the options given below :

- (1) Both **Statement I** and **Statement II** are correct
 (2) Both **Statement I** and **Statement II** are incorrect
 (3) **Statement I** is correct but **Statement II** is incorrect
 (4) **Statement I** is incorrect but **Statement II** is correct

31. An ideal gas follows a process described by the equation $PV^2 = C$ from the initial (P_1, V_1, T_1) to final (P_2, V_2, T_2) thermodynamics states, where C is a constant. Then :

- (1) If $P_1 > P_2$ then $T_1 < T_2$
 (2) If $V_2 > V_1$ then $T_2 > T_1$
 (3) If $V_2 > V_1$ then $T_2 < T_1$
 (4) If $P_1 > P_2$ then $V_1 > V_2$

32. A standard filament lamp consumes 100 W when connected to 200 V ac mains supply. The peak current through the bulb will be :

- (1) 0.707 A (2) 1 A
 (3) 1.414 A (4) 2 A

33. Let R_1 be the radius of the second stationary orbit and R_2 be the radius of the fourth stationary orbit of an electron in Bohr's model. The ratio $\frac{R_1}{R_2}$ is :

- (1) 0.25 (2) 0.5
 (3) 2 (4) 4

34. The physical quantity that has the same dimensional formula as pressure is :

- (1) Force
 (2) Momentum
 (3) Young's modulus of elasticity
 (4) Coefficient of viscosity

35. An energy of 484 J is spent in increasing the speed of a flywheel from 60 rpm to 360 rpm. The moment of inertia of the flywheel is :

- (1) 0.7 kg-m² (2) 3.22 kg-m²
 (3) 30.8 kg-m² (4) 0.07 kg-m²

Physics : Section-B (Q. No. 36 to 50)

36. The magnetic flux linked to a circular coil of radius R is :

$$\phi = 2t^3 + 4t^2 + 2t + 5 \text{ Wb}$$

The magnitude of induced emf in the coil at $t = 5$ s is:

- (1) 108 V (2) 197 V
 (3) 150 V (4) 192 V

37. An astronomical refracting telescope is being used by an observer to observe planets in normal adjustment. The focal lengths of the objective and eye piece used in the construction of the telescope are 20 m and 2 cm respectively. Consider the following statements about the telescope :

- (a) The distance between the objective and eye piece is 20.02 m
- (b) The magnification of the telescope is $(-)$ 1000
- (c) The image of the planet is erect and diminished
- (d) The aperture of eye piece is smaller than that of objective

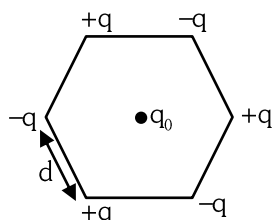
The correct statements are :

- (1) (a), (b) and (c)
- (2) (b), (c) and (d)
- (3) (c), (d) and (a)
- (4) (a), (b) and (d)

38. At any instant, two elements X_1 and X_2 have same number of radioactive atoms. If the decay constant of X_1 and X_2 are 10λ and λ respectively. then the time when the ratio of their atoms becomes $\frac{1}{e}$ respectively will be :

- (1) $\frac{1}{11\lambda}$
- (2) $\frac{1}{9\lambda}$
- (3) $\frac{1}{6\lambda}$
- (4) $\frac{1}{5\lambda}$

39. Six charges $+q, -q, +q, -q, +q$ and $-q$ are fixed at the corners of a hexagon of side d as shown in the figure. The work done in bringing a charge q_0 to the centre of the hexagon from infinity is : (ϵ_0 – permittivity of free space)

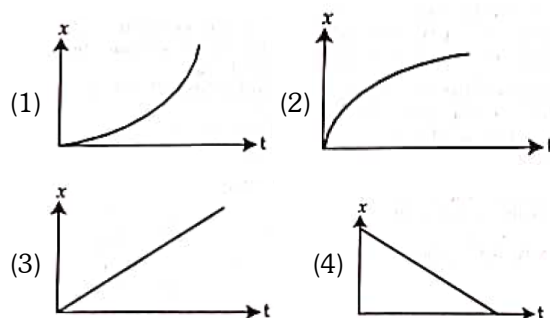


- (1) Zero
- (2) $\frac{-q^2}{4\pi\epsilon_0 d}$
- (3) $\frac{-q^2}{4\pi\epsilon_0 d} \left(3 - \frac{1}{\sqrt{2}} \right)$
- (4) $\frac{-q^2}{4\pi\epsilon_0 d} \left(6 - \frac{1}{\sqrt{2}} \right)$

40. An organ pipe filled with a gas at 27°C resonates at 400 Hz in its fundamental mode. If it is filled with the same gas at 90°C , the resonance frequency at the same mode will be :-

- (1) 420 Hz
- (2) 440 Hz
- (3) 484 Hz
- (4) 512 Hz

41. The position-time ($x - t$) graph for positive acceleration is :



42. The collector current in a common base amplifier using n-p-n transistor is 24 mA. If 80% of the electrons released by the emitter is accepted by the collector, then the base current is numerically:

- (1) 6 mA and leaving the base
- (2) 3 mA and leaving the base
- (3) 6 mA and entering the base
- (4) 3 mA and entering the base

43. Three vessels of equal capacity have gases at the same temperature and pressure. The first vessel contains helium (monoatomic), the second contains fluorine (diatomic) and the third contains sulfur hexafluoride (polyatomic). The correct statement, among the following is:

- (1) All vessels contain unequal number of respective molecules
- (2) The root mean square speed of molecules is same in all three cases
- (3) The root mean square speed of helium is the largest
- (4) The root mean square speed of sulfur hexafluoride is the largest

44. In a gravitational field, the gravitational potential is given by, $V = -\frac{K}{x}$ (J/kg). The gravitational field intensity at point (2, 0, 3) m is:

(1) $+\frac{K}{2}$ (2) $-\frac{K}{2}$
 (3) $-\frac{K}{4}$ (4) $+\frac{K}{4}$

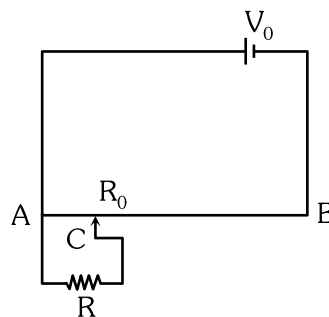
45. Two very long, straight, parallel conductors A and B carry current of 5A and 10A respectively and are at a distance of 10 cm from each other. The direction of current in two conductors is same. The force acting per unit length between two conductors is:

($\mu_0 = 4\pi \times 10^{-7}$ SI unit)

- (1) $2 \times 10^{-4} \text{ Nm}^{-1}$ and is attractive
 (2) $2 \times 10^{-4} \text{ Nm}^{-1}$ and is repulsive
 (3) $1 \times 10^{-4} \text{ Nm}^{-1}$ and is attractive
 (4) $1 \times 10^{-4} \text{ Nm}^{-1}$ and is repulsive
46. The magnetic field on the axis of a circular loop of radius 100 cm carrying current $I = \sqrt{2} \text{ A}$, at point 1 m away from the centre of the loop is given by:
- (1) $3.14 \times 10^{-7} \text{ T}$
 (2) $6.28 \times 10^{-7} \text{ T}$
 (3) $3.14 \times 10^{-4} \text{ T}$
 (4) $6.28 \times 10^{-4} \text{ T}$
47. Two rods one made of copper and other made of steel of the same length and same cross sectional area are joined together. The thermal conductivity of copper and steel are $385 \text{ J s}^{-1} \text{ K}^{-1} \text{ m}^{-1}$ and $50 \text{ J s}^{-1} \text{ K}^{-1} \text{ m}^{-1}$ respectively. The free ends of copper and steel are held at 100°C and 0°C respectively. The temperature at the junction is, nearly:

(1) 12°C (2) 50°C
 (3) 73°C (4) 88.5°C

48. The sliding contact C is at one fourth of the length of the potentiometer wire (AB) from A as shown in the circuit diagram. If the resistance of the wire AB is R_0 , then the potential drop (V) across the resistor R is:



- (1) $\frac{4V_0R}{3R_0 + 16R}$
 (2) $\frac{4V_0R}{3R_0 + R}$
 (3) $\frac{2V_0R}{4R_0 + R}$
 (4) $\frac{2V_0R}{2R_0 + 3R}$
49. The ratio of coulomb's electrostatic force to the gravitational force between an electron and a proton separated by some distance is 2.4×10^{39} . The ratio of the proportionality constant, $K = \frac{1}{4\pi\epsilon_0}$ to the Gravitational constant G is nearly (Given that the charge of the proton and electron each = $1.6 \times 10^{-19} \text{ C}$, the mass of the electron = $9.11 \times 10^{-31} \text{ kg}$, the mass of the proton = $1.67 \times 10^{-27} \text{ kg}$):
- (1) 10^{20} (2) 10^{30}
 (3) 10^{40} (4) 10
50. The percentage error in the measurement of g is:

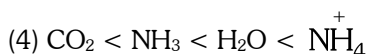
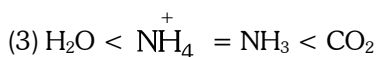
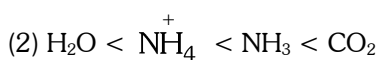
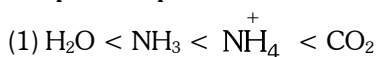
(Given that $g = \frac{4\pi^2 L}{T^2}$, $L = (10 \pm 0.1) \text{ cm}$,

$T = (100 \pm 1) \text{ s}$)

(1) 2% (2) 5%
 (3) 3% (4) 7%

Chemistry : Section-A (Q. No. 51 to 85)

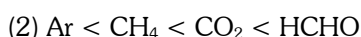
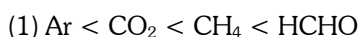
51. The correct order of bond angles in the following compounds/species is:



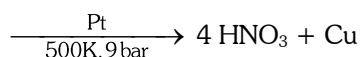
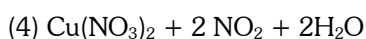
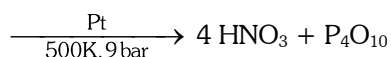
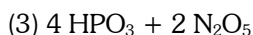
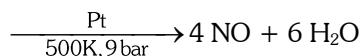
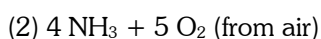
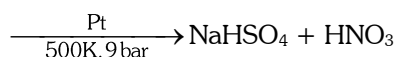
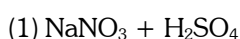
52. K_H value for some gases at the same temperature 'T' are given :

gas	$K_H/\text{k bar}$
Ar	40.3
CO_2	1.67
HCHO	1.83×10^{-5}
CH_4	0.413

where K_H is Henry's Law constant in water. The order of their solubility in water is :



53. Which of the following reactions is a part of the large scale industrial preparation of nitric acid ?



54. CaCl_2 and $\text{Ca}(\text{OCl})_2$ are components of :

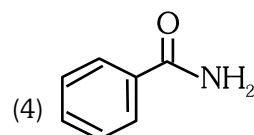
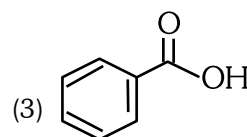
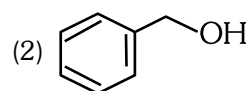
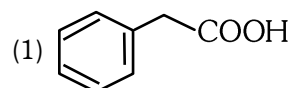
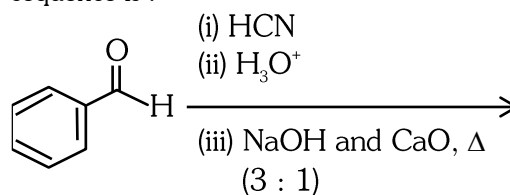
(1) gypsum

(2) Portland cement

(3) bleaching powder

(4) lime water

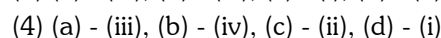
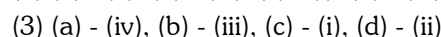
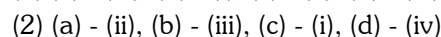
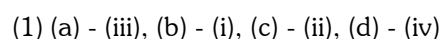
55. The product formed from the following reaction sequence is :



56. Match List - I with List - II :

List - I (Reaction)	List - II (Product formed)
(a) Gabriel synthesis	(i) Benzaldehyde
(b) Kolbe synthesis	(ii) Ethers
(c) Williamson synthesis	(iii) Primary amines
(d) Etard reaction	(iv) Salicylic acid

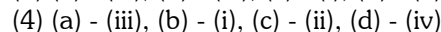
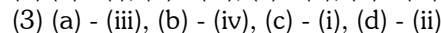
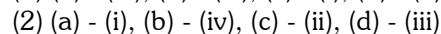
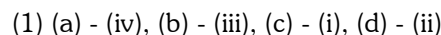
Choose the correct answer from the options given below :



57. Match List - I with List - II

List - I	List - II
(a) Sodium laurylsulphate	(i) Toilet soap
(b) Cetyltrimethyl ammonium chloride	(ii) Non-ionic detergent
(c) Sodium stearate	(iii) Anionic detergent
(d) Polyethyleneglycol stearate	(iv) Cationic detergent

Choose the correct answer from the options given below :



58. Which of the following reactions is a decomposition redox reaction ?

- (1) $2\text{Pb}(\text{NO}_3)_2(\text{s}) \rightarrow 2\text{PbO}(\text{s}) + 4\text{NO}_2(\text{g}) + \text{O}_2(\text{g})$
 (2) $\text{N}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{NO}(\text{g})$
 (3) $\text{Cl}_2(\text{g}) + 2\text{OH}^-(\text{aq}) \rightarrow \text{ClO}^-(\text{aq}) + \text{Cl}^-(\text{aq}) + \text{H}_2\text{O}(\ell)$
 (4) $\text{P}_4(\text{s}) + 3\text{OH}^-(\text{aq}) + 3\text{H}_2\text{O}(\ell) \rightarrow \text{PH}_3(\text{g}) + 3\text{H}_2\text{PO}_2^-(\text{aq})$

59. If first ionization enthalpies of element X and Y are 419 kJ mol^{-1} and 590 kJ mol^{-1} , respectively and second ionization enthalpies of X and Y are 3069 kJ mol^{-1} and 1145 kJ mol^{-1} , respectively.

Then **correct** statement is :-

- (1) X is an alkali metal and Y is an alkaline earth metal.
 (2) X is an alkaline earth metal and Y is an alkali metal.
 (3) Both X and Y are alkali metals.
 (4) Both X and Y are alkaline earth metals.

60. Predict the order of reactivity of the following four isomers towards $\text{S}_\text{N}2$ reaction.

- (I) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Cl}$
 (II) $\text{CH}_3\text{CH}_2\text{CH}(\text{Cl})\text{CH}_3$
 (III) $(\text{CH}_3)_2\text{CHCH}_2\text{Cl}$
 (IV) $(\text{CH}_3)_3\text{CCl}$

- (1) (IV) > (III) > (II) > (I)
 (2) (I) > (II) > (III) > (IV)
 (3) (I) > (III) > (II) > (IV)
 (4) (IV) > (II) > (III) > (I)

61. Match List-I with List-II :

	List-I (Molecules)		List-II (Shape)
(a)	NH_3	(i)	Square pyramidal
(b)	ClF_3	(ii)	Trigonal bipyramidal
(c)	PCl_5	(iii)	Trigonal pyramidal
(d)	BrF_5	(iv)	T-shape

Choose the **correct answer** from the options given below :

- (1) (a) – (ii), (b) – (iii), (c) – (iv), (d) – (i)
 (2) (a) – (iii), (b) – (iv), (c) – (ii), (d) – (i)
 (3) (a) – (iv), (b) – (iii), (c) – (i), (d) – (ii)
 (4) (a) – (iii), (b) – (iv), (c) – (i), (d) – (ii)

62. Which among the following is a thermoplastic polymer ?

- (1) Bakelite
 (2) Polythene
 (3) Urea-formaldehyde resin
 (4) Melamine polymer

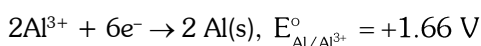
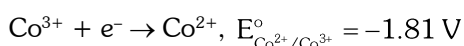
63. Match List-I with List-II :

	List-I (Compounds)		List-II (Molecular formula)
(a)	Borax	(i)	NaBO_2
(b)	Kernite	(ii)	$\text{Na}_2\text{B}_4\text{O}_7 \cdot 4\text{H}_2\text{O}$
(c)	Orthoboric acid	(iii)	H_3BO_3
(d)	Borax bead	(iv)	$\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$

Choose the **correct answer** from the options given below :

- (1) (a) – (iv), (b) – (ii), (c) – (iii), (d) – (i)
 (2) (a) – (ii), (b) – (iv), (c) – (iii), (d) – (i)
 (3) (a) – (iii), (b) – (i), (c) – (iv), (d) – (ii)
 (4) (a) – (i), (b) – (iii), (c) – (iv), (d) – (ii)

64. Two half cell reactions are given below :



The standard EMF of a cell with feasible redox reaction will be :

- (1) +7.09 V (2) +0.15 V
 (3) +3.47 V (4) –3.47 V

65. The element used for welding metals with high melting points is :

- (1) Cl_2 (2) H_2
 (3) Ne (4) He

66. $\text{Na}_2\text{B}_4\text{O}_7 \xrightarrow{\text{heat}} \text{X} + \text{NaBO}_2$

in the above reaction the product "X" is :

- (1) H_3BO_3 (2) B_2O_3
 (3) $\text{Na}_2\text{B}_2\text{O}_5$ (4) NaB_3O_5

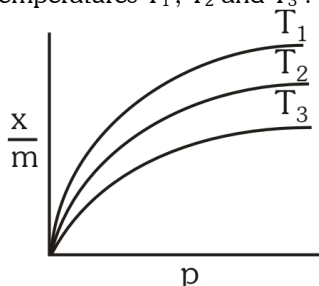
67. The correct order of first ionization enthalpy for the given four element is :

- (1) $\text{C} < \text{N} < \text{F} < \text{O}$ (2) $\text{C} < \text{N} < \text{O} < \text{F}$
 (3) $\text{C} < \text{O} < \text{N} < \text{F}$ (4) $\text{C} < \text{F} < \text{N} < \text{O}$

68. 0.01 M acetic acid solution is 1% ionised, then pH of this acetic acid solution is :

(1) 3 (2) 2
(3) 4 (4) 1

69. Shown below are adsorption isotherms for a gas 'X' at temperatures T_1 , T_2 and T_3 :



p and $\frac{x}{m}$ represent pressure and extent of adsorption, respectively. The correct order of temperatures for the given adsorption is:

(1) $T_1 > T_2 > T_3$ (2) $T_3 > T_2 > T_1$
(3) $T_1 = T_2 = T_3$ (4) $T_1 = T_2 > T_3$

70. The half life of a first order reaction is 2000 years. If the concentration after 8000 years is 0.02 M, then the initial concentration was :

(1) 0.16 M (2) 0.32 M
(3) 0.08 M (4) 0.04 M

71. One mole of an ideal gas at 300 K is expanded isothermally from 1 L to 10 L volume. ΔU for this process is

(Use $R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$)

(1) 1260 J (2) 2520 J
(3) 5040 J (4) 0 J

72. What is the hybridization shown by C_1 and C_2 carbons, respectively in the given compound ?



(1) sp^2 and sp^3 (2) sp^2 and sp^2
(3) sp^3 and sp^2 (4) sp^3 and sp^3

73. The density of the solution is 2.15 g mL^{-1} , then mass of 2.5 mL solution in correct significant figures is

(1) $5375 \times 10^{-3} \text{ g}$ (2) 5.4 g
(3) 5.38 g (4) 53.75 g

74. Flourine is a stronger oxidising agent than chlorine because :

(a) F-F bond has a low enthalpy of dissociation.
(b) Flouride ion (F^-) has high hydration enthalpy.
(c) Electron gain enthalpy of flourine is less negative than chlorine.
(d) Flourine has a very small size.

Choose the most appropriate answer from the options given :

(1) (a) and (b) only
(2) (a) and (c) only
(3) (a) and (d) only
(4) (b) and (c) only

75. Match **List-I** with **List-II** :

List-I (Complexes)	List-II (Types)
(a) $[\text{Co}(\text{NH}_3)_5\text{NO}_2]\text{Cl}_2$ and $[\text{Co}(\text{NH}_3)_5\text{ONO}]\text{Cl}_2$	(i) ionisation isomerism
(b) $[\text{Cr}(\text{NH}_3)_6]$ $[\text{Co}(\text{CN})_6]$ and $[\text{Cr}(\text{CN})_6]$ $[\text{Co}(\text{NH}_3)_6]$	(ii) coordination isomerism
(c) $[\text{Co}(\text{NH}_3)_5(\text{SO}_4)]\text{Br}$ and $[\text{Co}(\text{NH}_3)_5\text{Br}]\text{SO}_4$	(iii) linkage isomerism
(d) $[\text{Cr}(\text{H}_2\text{O})_6]\text{Cl}_3$ and $[\text{Cr}(\text{H}_2\text{O})_5\text{Cl}]\text{Cl}_2 \cdot \text{H}_2\text{O}$	(iv) solvate isomerism

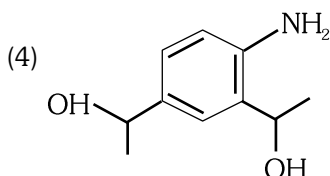
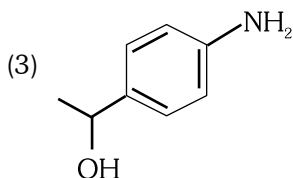
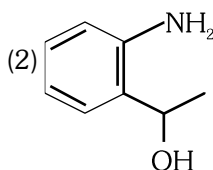
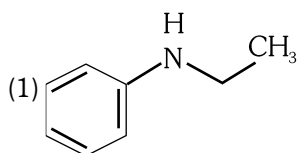
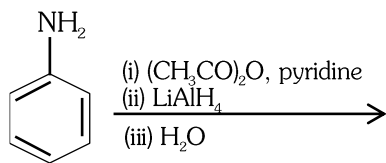
Choose the **correct answer** from the options given below :

(1) (a)-(iii), (b)-(i), (c)-(ii), (d)-(iv)
(2) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)
(3) (a)-(iii), (b)-(ii), (c)-(i), (d)-(iv)
(4) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)

76. The incorrect statement about denaturation of proteins is

(1) It results due to change of temperature and/or pH
(2) It results in loss of biological activity of proteins.
(3) A protein is formed from amino acids linked by peptide bonds.
(4) Uncoiling of the helical structure takes place.

77. The product formed from the following reaction sequence is



78. Match List-I with List-II :

List-I**(Defects)**

(a) Frenkel defect

(b) Schottky defect

(c) Vacancy defect

(d) Interstitial defect

List-II**(shown by)**

(i) non-ionic solids and density of the solid decreases

(ii) non-ionic solids and density of the solid increases

(iii) ionic solids and density of the solid decreases.

(iv) ionic solids and density of the solid remains constant.

Choose the **correct answer** from the options given below :

- (1) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)
 (2) (a)-(i), (b)-(iii), (c)-(ii), (d)-(iv)
 (3) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)
 (4) (a)-(iv), (b)-(iii), (c)-(i), (d)-(ii)

79. Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

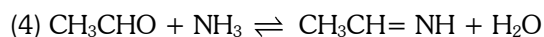
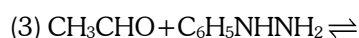
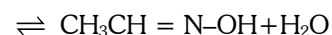
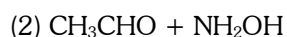
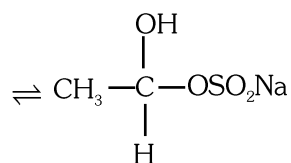
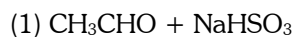
Assertion (A) : Chlorine is an electron withdrawing group but it is ortho, para directing in electrophilic aromatic substitution.

Reason (R) :

Inductive effect of chlorine destabilises the intermediate carbocation formed during the electrophilic substitution, however due to the more pronounced resonance effect, the halogen stabilises the carbocation at ortho and para positions.

In the light of the above statements, choose the most appropriate answer from the options given below :

- (1) Both **(A)** and **(R)** are correct and **(R)** is the correct explanation of **(A)**
 (2) Both **(A)** and **(R)** are correct but **(R)** is not the correct explanation of **(A)**
 (3) **(A)** is correct but **(R)** is not correct
 (4) **(A)** is not correct but **(R)** is correct.
80. Which of the following reactions is not an example for nucleophilic addition – elimination reaction ?



81. Four gas cylinders containing He, N₂, CO₂ and NH₃ gases separately are gradually cooled from a temperature of 500 K. Which gas will liquify first? (Given T_C in K – He : 5.3, N₂ : 126, CO₂ : 304.1 and NH₃ : 405.5)

- (1) He (2) N₂
(3) CO₂ (4) NH₃

82. Decrease in size from left to right in actinoid series is greater and gradual than that in lanthanoid series due to :

- (1) 4 f orbitals are penultimate
(2) 4 f orbitals have greater shielding effect
(3) 5 f orbitals have poor shielding effect
(4) 5 f orbitals have greater shielding effect

83. The decreasing order of boiling points of the following alkanes is :

- (a) Heptane (b) butane
(c) 2-methylbutane (d) 2-methylpropane
(e) hexane

Choose the **correct answer** from the options given below :

- (1) (a) > (c) > (e) > (d) > (b)
(2) (c) > (d) > (a) > (e) > (b)
(3) (a) > (e) > (b) > (c) > (d)
(4) (a) > (e) > (c) > (b) > (d)

84. Match the reagents (**List-I**) with the product (**List-II**) obtained from phenol.

	List-I		List-II
(a)	(i) NaOH (ii) CO ₂ (iii) H ⁺	(i)	Benzoquinone
(b)	(i) Aqueous NaOH + CHCl ₃ (ii) H ⁺	(ii)	Benzene
(c)	Zn duct, Δ	(iii)	Salicyl aldehyde
(d)	Na ₂ Cr ₂ O ₇ , H ₂ SO ₄	(iv)	Salicylic acid

Choose the **correct answer** from the options given below :

- (1) (a) – (iii), (b) – (iv), (c) – (i), (d) – (ii)
(2) (a) – (ii), (b) – (i), (c) – (iv), (d) – (iii)
(3) (a) – (iv), (b) – (iii), (c) – (ii), (d) – (i)
(4) (a) – (iv), (b) – (ii), (c) – (i), (d) – (iii)

85. Match **List-I** with **List-II** :

	List-I (quantum number)		List-II (Orbital)
(a)	n = 2, ℓ = 1	(i)	2 s
(b)	n = 3, ℓ = 2	(ii)	3 s
(c)	n = 3, ℓ = 0	(iii)	2 p
(d)	n = 2, ℓ = 0	(iv)	3 d

Choose the **correct answer** from the options given below :

- (1) (a) – (iii), (b) – (iv), (c) – (i), (d) – (ii)
(2) (a) – (iv), (b) – (iii), (c) – (i), (d) – (ii)
(3) (a) – (iv), (b) – (iii), (c) – (ii), (d) – (i)
(4) (a) – (iii), (b) – (iv), (c) – (ii), (d) – (i)

Chemistry : Section-B (Q. No. 86 to 100)

86. Which one of the following is not a calcination reaction?

- (1) $\text{ZnCO}_3 \xrightarrow{\Delta} \text{ZnO} + \text{CO}_2$
(2) $\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O} \xrightarrow{\Delta} \text{Fe}_2\text{O}_3 + x\text{H}_2\text{O}$
(3) $\text{CaCO}_3 \cdot \text{MgCO}_3 \xrightarrow{\Delta} \text{CaO} + \text{MgO} + 2\text{CO}_2$
(4) $\text{CaCO}_3 + 2\text{HCl} \xrightarrow{\Delta} \text{CaCl}_2 + \text{H}_2\text{O} + \text{CO}_2$

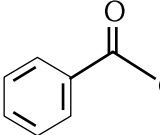
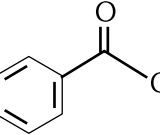
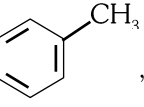
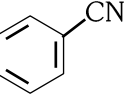
87. When electromagnetic radiation of wavelength 300 nm falls on the surface of a metal, electrons are emitted with the kinetic energy of $1.68 \times 10^5 \text{ J mol}^{-1}$.

What is the minimum energy needed to remove an electron from the metal ?

$$(h = 6.626 \times 10^{-34} \text{ Js}, c = 3 \times 10^8 \text{ ms}^{-1},$$

$$N_A = 6.022 \times 10^{23} \text{ mol}^{-1})$$

- (1) $2.31 \times 10^6 \text{ J mol}^{-1}$
(2) $3.84 \times 10^4 \text{ J mol}^{-1}$
(3) $3.84 \times 10^{-19} \text{ J mol}^{-1}$
(4) $2.31 \times 10^5 \text{ J mol}^{-1}$

88. For a chemical reaction
 $4A + 3B \rightarrow 6C + 9D$
 rate of formation of C is $6 \times 10^{-2} \text{ mol L}^{-1} \text{ s}^{-1}$ and
 rate of disappearance of A is $4 \times 10^{-2} \text{ mol L}^{-1} \text{ s}^{-1}$.
 The rate of reaction and amount of B consumed
 in interval of 10 seconds, respectively will be :
- (1) $1 \times 10^{-2} \text{ mol L}^{-1} \text{ s}^{-1}$ and $30 \times 10^{-2} \text{ mol L}^{-1}$
 - (2) $10 \times 10^{-2} \text{ mol L}^{-1} \text{ s}^{-1}$ and $10 \times 10^{-2} \text{ mol L}^{-1}$
 - (3) $1 \times 10^{-2} \text{ mol L}^{-1} \text{ s}^{-1}$ and $10 \times 10^{-2} \text{ mol L}^{-1}$
 - (4) $10 \times 10^{-2} \text{ mol L}^{-1} \text{ s}^{-1}$ and $30 \times 10^{-2} \text{ mol L}^{-1}$
89. The incorrect method for the synthesis of alkenes is:
- (1) treatment of alkynes with Na in liquid NH_3
 - (2) heating alkyl halides with alcoholic KOH
 - (3) treating alkyl halides in aqueous KOH solution
 - (4) treating vicinal dihalides with Zn metal
90. The incorrect method to synthesize benzaldehyde is:
- (1)  Cl , H_2 , Pd-BaSO₄
 - (2)  OC_2H_5 , DIBAL-H, followed by H_2O
 - (3)  CH_3 , CrO_2Cl_2 , followed by H_3O^+ in CS_2
 - (4)  CN , CH_3MgBr , followed by H_3O^+
91. What fraction of Fe exists as Fe(III) in $\text{Fe}_{0.96}\text{O}$?
 (Consider $\text{Fe}_{0.96}\text{O}$ to be made up of Fe(II) and Fe(III) only)
- (1) $\frac{1}{12}$
 - (2) 0.08
 - (3) $\frac{1}{16}$
 - (4) $\frac{1}{20}$

92. Given below are two statements : one is labelled as Assertion (A) and the other is labelled as Reason (R).

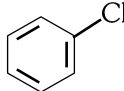

Assertion (A) :

The metal carbon bond in metal carbonyls possesses both σ and π character.

Reason (R) :

The ligand to metal bond is a π bond and metal to ligand bond is a σ bond.

In the light of the above statements, choose the most appropriate answer from the options given below :

- (1) Both (A) and (R) are correct and (R) is the correct explanation of (A)
 - (2) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
 - (3) (A) is correct but (R) is not correct.
 - (4) (A) is not correct but (R) is correct.
93. Which one of the following reaction sequence is incorrect method to prepare phenol ?
- (1) Aniline, $\text{NaNO}_2 + \text{HCl}$, H_2O , heating
 - (2) Cumene, O_2 , H_3O^+
 - (3)  Cl , NaOH , STP condition
 - (4)  , oleum, NaOH , H_3O^+
94. A vessel contains 3.2 g of dioxygen gas at STP (273.15 K and 1 atm pressure). The gas is now transferred to another vessel at constant temperature, where pressure becomes one third of the original pressure. The volume of new vessel in L is :
- (Given - molar volume at STP is 22.4 L)
- (1) 6.72
 - (2) 2.24
 - (3) 22.4
 - (4) 67.2

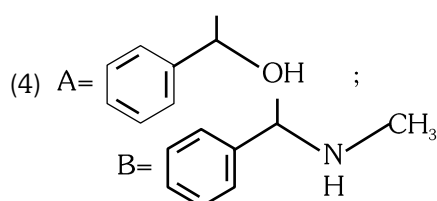
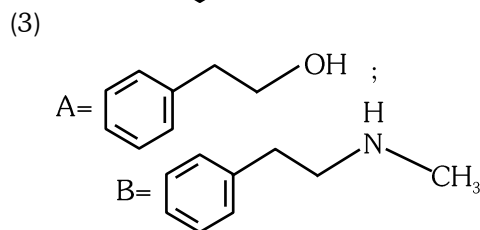
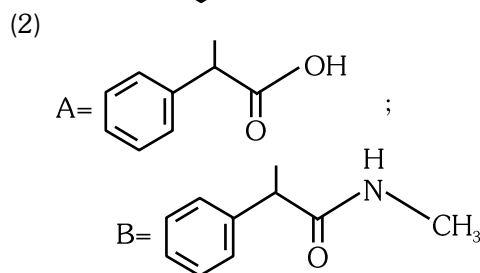
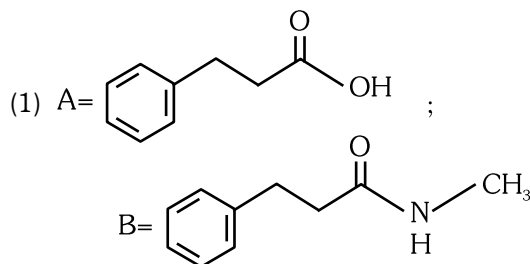
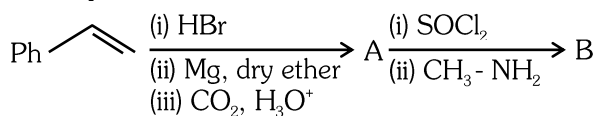
95. Match List-I with List-II :

List-I		List-II	
(a)	Biochemical oxygen demand	(i)	Oxidising mixture
(b)	Photochemical smog	(ii)	Polar stratospheric cloud
(c)	Classical smog	(iii)	organic matter in water
(d)	Ozone layer depletion	(iv)	reducing mixture

Choose the correct answer from the options given below :

- (1) (a)-(i), (b)-(iv), (c)-(ii), (d)-(iii)
 (2) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)
 (3) (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii)
 (4) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)

96. The products A and B in the following reaction sequence are :



97. Given below are two statements :

Statement I :

Cr^{2+} is oxidising and Mn^{3+} is reducing in nature.

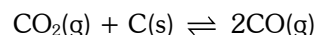
Statement II :

Sc^{3+} compounds are repelled by the applied magnetic field.

In the light of the above statements, choose the most appropriate answer from the options given below :

- (1) Both **Statement I** and **Statement II** are correct
 (2) Both **Statement I** and **Statement II** are incorrect
 (3) **Statement I** is correct but **Statement II** is incorrect
 (4) **Statement I** is incorrect but **Statement II** is correct

98. K_p for the following reaction is 3.0 at 1000 K.

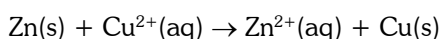


What will be the value of K_c for the reaction at the same temperature ?

(Given - $R = 0.083 \text{ L bar K}^{-1} \text{ mol}^{-1}$)

- (1) 0.36
 (2) 3.6×10^{-2}
 (3) 3.6×10^{-3}
 (4) 3.6

99. Standard electrode potential for the cell with cell reaction

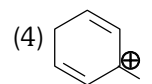
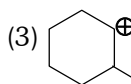
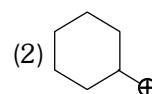
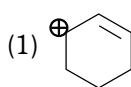


is 1.1 V. Calculate the standard gibbs energy change for the cell reaction.

(Given $F = 96487 \text{ C mol}^{-1}$)

- (1) $-200.27 \text{ kJ mol}^{-1}$
 (2) $-212.27 \text{ kJ mol}^{-1}$
 (3) $-212.27 \text{ J mol}^{-1}$
 (4) $-200.27 \text{ J mol}^{-1}$

100. Which of the following is the most stable carbocation?



Botany : Section-A (Q. No. 101 to 135)

101. Which stage of meiosis can last for months or years in the oocytes of some vertebrates ?

- (1) Leptotene
- (2) Pachytene
- (3) Diplotene
- (4) Diakinesis

102. When one CO₂ molecule is fixed as one molecule of triose phosphate, which of the following photochemically made, high energy chemical intermediates are used in the reduction phase ?

- (1) 1 ATP + 1 NADPH
- (2) 1 ATP + 2 NADPH
- (3) 2 ATP + 1 NADPH
- (4) 2 ATP + 2 NADPH

103. In *lac* operon, *z* gene codes for :

- (1) β -galactosidase
- (2) Permease
- (3) Repressor
- (4) Transacetylase

104. Initiation of lateral roots and vascular cambium during secondary growth takes place in cells of :

- (1) Epiblema
- (2) Cortex
- (3) Endodermis
- (4) Pericycle

105. Match **List - I** with **List - II** :

List - I	List - II
(a) Adenine	(i) Pigment
(b) Anthocyanin	(ii) Polysaccharide
(c) Chitin	(iii) Alkaloid
(d) Codeine	(iv) Purine

Choose the **correct answer** from the options given below :

- (1) (a) - (iv), (b) - (i), (c) - (ii), (d) - (iii)
- (2) (a) - (iv), (b) - (iii), (c) - (ii), (d) - (i)
- (3) (a) - (iii), (b) - (i), (c) - (iv), (d) - (ii)
- (4) (a) - (i), (b) - (iv), (c) - (iii), (d) - (ii)

106. Match **List - I** with **List - II** :

List - I	List - II
(a) In <i>lac</i> operon i gene codes for	(i) transacetylase
(b) In <i>lac</i> operon z gene codes for	(ii) permease
(c) In <i>lac</i> operon y gene codes for	(iii) β -galactosidase
(d) In <i>lac</i> operon a gene codes for	(iv) Repressor

Choose the **correct answer** from the options given below :

- (1) (a) - (iii), (b) - (ii), (c) - (i), (d) - (iv)
- (2) (a) - (iv), (b) - (iii), (c) - (ii), (d) - (i)
- (3) (a) - (iv), (b) - (i), (c) - (iii), (d) - (ii)
- (4) (a) - (iii), (b) - (i), (c) - (iv), (d) - (ii)

107. Match **List - I** with **List - II** :

List - I	List - II
(a) <i>Chlamydomonas</i>	(i) Moss
(b) <i>Cycas</i>	(ii) Pteridophyte
(c) <i>Selaginella</i>	(iii) Alga
(d) <i>Sphagnum</i>	(iv) Gymnosperm

Choose the **correct answer** from the options given below :

- (1) (a) - (iii), (b) - (i), (c) - (ii), (d) - (iv)
- (2) (a) - (iii), (b) - (iv), (c) - (ii), (d) - (i)
- (3) (a) - (iii), (b) - (ii), (c) - (i), (d) - (iv)
- (4) (a) - (ii), (b) - (iii), (c) - (i), (d) - (iv)

108. Given below are two statements :

Statement I :

DNA polymerases catalyse polymerisation only in one direction, that is $5' \rightarrow 3'$

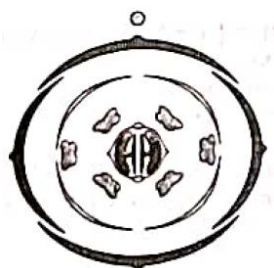
Statement II :

During replication of DNA, on one strand the replication is continuous while on other strand it is discontinuous.

In the light of the above statements, choose the **correct answer** from the options given below :

- (1) Both **Statement I** and **Statement II** are correct
- (2) Both **Statement I** and **Statement II** are incorrect
- (3) **Statement I** is correct but **Statement II** is incorrect
- (4) **Statement I** is incorrect but **Statement II** is correct

109. The Floral Diagram represents which one of the following families ?



- | | |
|----------------|------------------|
| (1) Fabaceae | (2) Brassicaceae |
| (3) Solanaceae | (4) Liliaceae |

110. The pioneer species in a hydrarch succession are :

- (1) Free-floating angiosperms
- (2) Submerged rooted plants
- (3) Phytoplanktons
- (4) Filamentous algae

111. The number of time(s) decarboxylation of isocitrate occurs during single TCA cycle is :

- | | |
|-----------|----------|
| (1) One | (2) Two |
| (3) Three | (4) Four |

112. Given below are two statements :

Statement I :

Sickle cell anaemia and Haemophilia are autosomal dominant traits .

Statement II :

Sickle cell anaemia and Haemophilia are disorders of the blood.

In the light of the above statements, choose the **correct answer** from the options given below :

- (1) Both **Statement I** and **Statement II** are correct
- (2) Both **Statement I** and **Statement II** are incorrect
- (3) **Statement I** is correct but **Statement II** is incorrect
- (4) **Statement I** is incorrect but **Statement II** is correct

113. Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) :

When a particular restriction enzyme cuts strand of DNA, overhanging stretches or sticky ends are formed.

Reason (R) :

Some restriction enzymes cut the strand of DNA a little away from the centre of palindromic site.

In the light of the above statements, choose the **correct answer** from the options given below :

- (1) Both **(A)** and **(R)** are correct and **(R)** is the correct explanation of **(A)**
- (2) Both **(A)** and **(R)** are correct but **(R)** is not the correct explanation of **(A)**
- (3) **(A)** is correct but **(R)** is not correct
- (4) **(A)** is not correct but **(R)** is correct

114. Give the correct descending order of organisms with reference to their estimated number found in Amazon forest.

- (a) Plants
- (b) Invertebrates
- (c) Fishes
- (d) Mammals
- (e) Birds

Choose the **correct answer** from the options given below :

- (1) (a) > (b) > (e) > (d) > (c)
- (2) (a) > (c) > (d) > (b) > (e)
- (3) (b) > (a) > (e) > (d) > (c)
- (4) (b) > (a) > (c) > (e) > (d)

115. Match **List - I** with **List - II** :

List - I	List - II
(a) Porins	(i) Pink coloured nodules
(b) <i>leg</i> haemoglobin	(ii) Lumen of thylakoid
(c) H^+ accumulation	(iii) Amphibolic pathway
(d) Respiration	(iv) Huge pores in outer membrane of mitochondria

Choose the **correct answer** from the options given below :

- (1) (a) - (ii), (b) - (i), (c) - (iv), (d) - (iii)
- (2) (a) - (iv), (b) - (i), (c) - (ii), (d) - (iii)
- (3) (a) - (iii), (b) - (iv), (c) - (ii), (d) - (i)
- (4) (a) - (ii), (b) - (iv), (c) - (i), (d) - (iii)

116. Which of the following growth regulators is an adenine derivative ?

- (1) Auxin
- (2) Cytokinin
- (3) Ethylene
- (4) Absciscic acid

117. The type of tissue commonly found in the fruit wall of nuts is :

- (1) Parenchyma
- (2) Collenchyma
- (3) Sclerenchyma
- (4) Sclereid

118. The species that come to appear in bare area are called :

- (1) Pioneer species
- (2) Invasive species
- (3) Competitive species
- (4) Species of seral community

119. In general the egg apparatus of embryo sac in angiosperm consists of :

- (1) One egg cell, two synergids, three antipodal cells, two Polar nuclei
- (2) One egg cell, two synergids, two antipodal cells, three Polar nuclei
- (3) One egg cell, three synergids, two antipodal cells, two Polar nuclei
- (4) One egg cell, two synergids, two antipodal cells, two Polar nuclei

* There is no correct answer of this question in given options, but if in the given question "egg apparatus of" words are removed then best possible option will be (1) in the code U6 i.e. "one egg cell, two synergids, three antipodal cells, two polar nuclei".

120. Match **List - I** with **List - II** :

List - I	List - II
(a) Imbricate	(i) <i>Calotropis</i>
(b) Valvate	(ii) <i>Cassia</i>
(c) Vexillary	(iii) Cotton
(d) Twisted	(iv) Bean

Choose the **correct answer** from the options given below :

- (1) (a) - (ii), (b) - (i), (c) - (iii), (d) - (iv)
- (2) (a) - (ii), (b) - (i), (c) - (iv), (d) - (iii)
- (3) (a) - (ii), (b) - (iv), (c) - (iii), (d) - (i)
- (4) (a) - (i), (b) - (iii), (c) - (iv), (d) - (ii)

121. All successions irrespective of the habitat proceed to which type of climax community ?

- (1) Xeric
- (2) Mesic
- (3) Hydrophytic
- (4) Edaphic

122. Separation of DNA, fragments is done by a technique known as :

- (1) Polymerase Chain Reaction
- (2) Recombinant technology
- (3) Southern blotting
- (4) Gel electrophoresis

123. The phenomenon by which the undividing parenchyma cells start to divide mitotically during plant tissue culture is called as :

- (1) Differentiation
- (2) Dedifferentiation
- (3) Redifferentiation
- (4) Secondary growth

- 124.** In meiosis, crossing over and exchange of genetic material between homologous chromosomes are catalyzed by the enzyme.
- (1) Phosphorylase
 - (2) Recombinase
 - (3) Transferase
 - (4) Polymerase
- 125.** The 5-C compound formed during TCA cycle is :
- (1) α -ketoglutaric acid
 - (2) Oxalo succinic acid
 - (3) Succinic acid
 - (4) Fumaric acid
- 126.** When a carrier protein facilitates the movement of two molecules across the membrane in same direction, it is called :
- (1) Uniport
 - (2) Transport
 - (3) Antiport
 - (4) Symport
- 127.** The World Summit on sustainable development held in 2002 in Johannesburg, South Africa pledged for:
- (1) A significant reduction in the current rate of biodiversity loss.
 - (2) Declaration of more biodiversity hotspots.
 - (3) Increase in agricultural production
 - (4) Collection and preservation of seeds of different genetic strains of commercially important plants.
- 128.** Interfascicular cambium is present between :
- (1) Primary xylem and primary phloem
 - (2) Pericycle and endodermis
 - (3) Two vascular bundles
 - (4) Secondary xylem and secondary phloem
- 129.** The ascent of xylem sap in plants is mainly accomplished by the :
- (1) size of the stomatal aperture
 - (2) distribution of stomata on the upper and lower epidermis
 - (3) cohesion and adhesion between water molecules
 - (4) root pressure
- 130.** Which of the following statement is not correct?
- (1) Rhizome is a condensed form of stem
 - (2) The apical bud in rhizome always remains above the ground
 - (3) The rhizome is aerial with no distinct nodes and internodes
 - (4) The rhizome is thick, prostrate and branched
- 131.** To ensure that only the desired pollens fall on the stigma in artificial hybridization process :
- (a) the female flower buds of plant producing unisexual flower need not be bagged.
 - (b) there is no need to emasculate unisexual flowers of selected female parent
 - (c) emasculated flowers are to be bagged immediately after cross pollination
 - (d) emasculated flowers are to be bagged after removal of anthers
 - (e) bisexual flowers, showing protogyny are never selected for cross
- Choose the **correct answer** from the options given below :
- (1) (a), (b) and (c) only
 - (2) (b), (c) and (d) only
 - (3) (b), (c) and (e) only
 - (4) (a), (d) and (e) only
- 132.** The residual persistent part which forms the perisperm in the seeds of beet is :
- (1) Calyx
 - (2) Endosperm
 - (3) Nucellus
 - (4) Integument
- 133.** The chromosomal theory of inheritance was proposed by :
- (1) Thomas Morgan
 - (2) Sutton and Boveri
 - (3) Gregor Mendel
 - (4) Robert Brown
- 134.** Which of the following protects nitrogenase inside the root nodule of a leguminous plant ?
- (1) Catalase
 - (2) *leg* haemoglobin
 - (3) Transaminase
 - (4) Glutamate dehydrogenase
- 135.** The ability of plants to follow different pathways in response to environment leading to formation of different kinds of structures is called :
- (1) Redifferentiation
 - (2) Development
 - (3) Plasticity
 - (4) Differentiation

Botany : Section-B (Q. No. 136 to 150)

136. Which of the following pair represents free living nitrogen fixing aerobic bacteria?

- (1) *Rhizobium* and *Frankia*
- (2) *Azotobacter* and *Beijernickia*
- (3) *Anabaena* and *Rhodospirillum*
- (4) *Pseudomonas* and *Thiobacillus*

137. Match **List-I** with **List-II** :

List-I	List-II
(a) Sacred groves	(i) Alien species
(b) Zoological park	(ii) Release of large quantity of oxygen
(c) Nile perch	(iii) <i>Ex-situ</i> conservation
(d) Amazon forest	(iv) Khasi Hills in Meghalaya

Choose the **correct answer** from the options given below :

- (1) (a) - (iv), (b) - (iii), (c) - (i), (d) - (ii)
- (2) (a) - (ii), (b) - (iv), (c) - (i), (d) - (iii)
- (3) (a) - (iv), (b) - (i), (c) - (ii), (d) - (iii)
- (4) (a) - (iv), (b) - (iii), (c) - (ii), (d) - (i)

138. Primary proteins are also called as polypeptides because :

- (1) They are linear chains
- (2) They are polymers of peptide monomers
- (3) Successive amino acids are joined by peptide bonds
- (4) They can assume many conformations

139. Match **List-I** with **List-II** :

List-I	List-II
(a) Gene gun	(i) Replacement of a faulty gene by a normal healthy gene
(b) Gene therapy	(ii) Used for transfer of gene
(c) Gene cloning	(iii) Total DNA in the cells of an organism
(d) Genome	(iv) To obtain indentical copies of a particular DNA molecule

Choose the **correct answer** from the options given below :

- (1) (a) - (ii), (b) - (i), (c) - (iv), (d) - (iii)
- (2) (a) - (i), (b) - (iii), (c) - (ii), (d) - (iv)
- (3) (a) - (iv), (b) - (i), (c) - (iii), (d) - (ii)
- (4) (a) - (ii), (b) - (iii), (c) - (iv), (d) - (i)

140. Match **List-I** with **List-II** :

List-I	List-II
(a) Bacteriophage $\phi \times 174$	(i) 48502 base pairs
(b) Bacteriophage λ	(ii) 5386 nucleotides
(c) <i>Escherichia coli</i>	(iii) 3.3×10^9 base pairs
(d) Haploid content of human DNA	(iv) 4.6×10^6 base pairs

Choose the **correct answer** from the options given below:

- (1) (a) - (i), (b) - (ii), (c) - (iii), (d) - (iv)
- (2) (a) - (ii), (b) - (iv), (c) - (i), (d) - (iii)
- (3) (a) - (ii), (b) - (i), (c) - (iv), (d) - (iii)
- (4) (a) - (i), (b) - (ii), (c) - (iv), (d) - (iii)

141. Which of the following can be expected if scientists succeed in introducing apomictic gene into hybrid varieties of crops ?

- (1) Polyembryony will be seen and each seed will produce many plantlets
- (2) Seeds of hybrid plants will show longer dormancy
- (3) Farmers can keep on using the seeds produced by the hybrids to raise new crop year after year
- (4) There will be segregation of the desired characters only in the progeny

142. Read the following statements and identify the characters related to the alga shown in the diagram:

- (a) It is a member of Chlorophyceae
- (b) Food is stored in the form of starch
- (c) It is a monoecious plant showing oogonium and antheridium
- (d) Food is stored in the form of laminarin or mannitol
- (e) It shows dominance of pigments chlorophyll a, c and Fucoxanthin.

Choose the **correct answer** from the options given below :



- (1) (a) and (b) only (2) (a), (b) and (c) only
- (2) (a), (c) and (d) only (4) (c), (d) and (e) only

143. Frugivorous birds are found in large numbers in tropical forests mainly because of :

- (1) lack of niche specialisation
- (2) higher annual rainfall
- (3) availability of fruits throughout the year
- (4) temperature conducive for their breeding

144. Which type of substance would face difficulty to pass through the cell membrane?

- (1) Substance with hydrophobic moiety
- (2) Substance with hydrophilic moiety
- (3) All substance irrespective of hydrophobic and hydrophilic moiety
- (4) Substance soluble in lipids

145. Identify the correct statements regarding chemiosmotic hypothesis :

- (a) Splitting of the water molecule takes place on the inner side of the membrane.
- (b) Protons accumulate within the lumen of the thylakoids.
- (c) Primary acceptor of electron transfers the electrons to an electron carrier.
- (d) NADP reductase enzyme is located on the stroma side of the membrane.
- (e) Protons increase in number in stroma.

Choose the **correct answer** from the options given below:

- (1) (a), (b) and (e) (2) (a), (b) and (d)
- (3) (b), (c) and (d) (4) (b), (c) and (e)

146. If a female individual is with small round head, furrowed tongue, partially open mouth and broad palm with characteristic palm crease. Also the physical, psychomotor and mental development is retarded. The karyotype analysis of such an individual will show :

- (1) 47 chromosomes with XXY sex chromosomes
- (2) 45 chromosomes with XO sex chromosomes
- (3) 47 chromosomes with XYY sex chromosomes
- (4) Trisomy of chromosome 21

147. Identify the **correct** sequence of events during Prophase I of meiosis :

- (a) Synapsis of homologous chromosomes
- (b) Chromosomes become gradually visible under microscope
- (c) Crossing over between non-sister chromatids of homologous chromosomes
- (d) Terminalisation of chiasmata
- (e) Dissolution of synaptonemal complex

Choose the **correct answer** from the options given below :

- (1) (a), (b), (c), (d), (e)
- (2) (b), (c), (d), (e), (a)
- (3) (b), (a), (c), (e), (d)
- (4) (a), (c), (d), (e), (b)

- 148.** The enzyme (a) is needed for isolating genetic material from plant cells and enzyme (b) for isolating genetic material from fungus. Choose the correct pair of options from the following :

- (1) (a) Cellulase (b) Protease
(2) (a) Cellulase (b) Chitinase
(3) (a) Chitinase (b) Lipase
(4) (a) Cellulase (b) Lipase

- 149.** Match the **List-I** with **List-II** :

List-I	List-II
(a) Carbon dissolved in oceans	(i) 55 billion tons
(b) Annual fixation of carbon through photosynthesis	(ii) 71%
(c) PAR captured by plants	(iii) 4×10^3 kg
(d) Productivity of oceans	(iv) 2 to 10%

Choose the **correct answer** from the options given below :

- (1) (a) - (ii), (b) - (iv), (c) - (iii), (d) - (i)
(2) (a) - (iii), (b) - (iv), (c) - (ii), (d) - (i)
(3) (a) - (ii), (b) - (iii), (c) - (iv), (d) - (i)
(4) (a) - (iii), (b) - (ii), (c) - (i), (d) - (iv)

* Annual fixation of carbon through photosynthesis is 4×10^{13} kg however given data is 4×10^3 kg which is wrong but most appropriate answer is 3.

- 150.** What is the expected percentage of F_2 progeny with yellow and inflated pod in dihybrid cross experiment involving pea plants with green coloured, inflated pod and yellow coloured constricted pod ?
- (1) 100% (2) 56.25%
(3) 18.75 % (4) 9%

Zoology : Section-A (Q. No. 151 to 185)

- 151.** Pathogenic bacteria gain resistance to antibiotics due to changes in their :
(1) Cosmids (2) Plasmids
(3) Nucleus (4) Nucleoid
- 152.** Milk of transgenic 'Cow Rosie' was nutritionally more balanced product for human babies than natural cow milk because it contained:
(1) Human protein α -1-antitrypsin
(2) Human alpha-lactalbumin
(3) Human insulin-like growth factor
(4) Human enzyme Adenosine Deaminase (ADA)
- 153.** If the pH in lysosomes is increased to alkaline, what will be the outcome?
(1) Hydrolytic enzymes will function more efficiently
(2) Hydrolytic enzymes will become inactive
(3) Lysosomal enzymes will be released into the cytoplasm
(4) Lysosomal enzymes will be more active
- 154.** Choose the incorrect enzymatic reaction :
(1) Maltose $\xrightarrow{\text{Maltase}}$ Glucose + Galactose
(2) Sucrose $\xrightarrow{\text{Sucrase}}$ Glucose + Fructose
(3) Lactose $\xrightarrow{\text{Lactase}}$ Glucose + Galactose
(4) Dipeptides $\xrightarrow{\text{Dipeptidases}}$ Amino acids
- 155.** Which of the following reasons is mainly responsible for graft rejection in transplantation of organs ?
(1) Inability of recipient to differentiate between 'self and 'non-self' tissues/cells
(2) Humoral immune response only
(3) Auto-immune response
(4) Cell-mediated response
- 156.** If DNA contained sulphur instead of phosphorus and proteins contained phosphorus instead of sulfur, what would have been the outcome of Hershey and Chase experiment?
(1) No radioactive sulfur in bacterial cells
(2) Both radioactive sulfur and phosphorus in bacterial cells
(3) Radioactive sulfur in bacterial cells
(4) Radioactive phosphorus in bacterial cells

157. Two butterfly species are competing for the same nectar of a flower in a garden. To survive and coexist together, they may avoid competition in the same garden by:

- (1) feeding at the same time
- (2) choosing different foraging patterns
- (3) increasing time spent on attacking each other
- (4) predating on each other

158. Mad cow disease in cattle and Cr Jacob disease in humans are due to infection by _____.

- (1) Bacterium
- (2) Virus
- (3) Viroid
- (4) Prion

159. Which of the following is not an Intra Uterine Device?

- (1) Progestogens
- (2) Multiload 375
- (3) Lippes loop
- (4) Progestasert

160. Match **List-I** with **List-II** :

List-I

List-II

- | | |
|--------------------------|----------------|
| (a) <i>Chlamydomonas</i> | (i) Conidia |
| (b) <i>Penicillium</i> | (ii) Zoospores |
| (c) <i>Hydra</i> | (iii) Gemmules |
| (d) <i>Sponge</i> | (iv) Buds |

Choose the **correct answer** from the options given below:

- (1) (a) – (i), (b) – (iv), (c) – (iii), (d) – (ii)
- (2) (a) – (ii), (b) – (i), (c) – (iv), (d) – (iii)
- (3) (a) – (iii), (b) – (ii), (c) – (i), (d) – (iv)
- (4) (a) – (iv), (b) – (iii), (c) – (ii), (d) – (i)

161. According to the sliding filament theory:

- (1) Actin and myosin filaments slide over each other to increase the length of the sarcomere.
- (2) Length of A-band does not change.
- (3) I-band increases in length
- (4) The actin filaments slide away from A-band resulting in shortening of sarcomere.

162. The amount of biomass or organic matter produced per unit area over a time period by plants during photosynthesis is called:

- (1) Secondary production
- (2) Primary production
- (3) Gross primary production
- (4) Net primary production

163. Given below are two statements:

Statement I :

Amino acids have a property of ionizable nature of $-NH_2$ and $-COOH$ groups, hence have different structures at different pH.

Statement II :

Amino acids can exist as Zwitterionic form at acidic and basic pH.

In the light of the above statements, choose the **most appropriate answer** from the options given below:

- (1) Both **Statement I** and **Statement II** are correct
- (2) Both **Statement I** and **Statement II** are Incorrect
- (3) **Statement I** is correct but **Statement II** is incorrect
- (4) **Statement I** is incorrect but **Statement II** is correct

164. Which of the following types of epithelium is present in the bronchioles and Fallopian tubes?

- (1) Simple squamous epithelium
- (2) Simple columnar epithelium
- (3) Ciliated epithelium
- (4) Stratified squamous epithelium

165. Western Ghats have a large number of plants and animal species that are not found anywhere else. Which of the following term is used to notify such species?

- (1) Threatened species
- (2) Keystone species
- (3) Endemic species
- (4) Vulnerable species

166. Gout is a type of disorder which leads to:

- (1) Inflammation of joints due to accumulation of uric acid crystals
- (2) Weakening of bones due to decreased bone mass
- (3) Inflammation of joints due to cartilage degeneration
- (4) Weakening of bones due to low calcium level

167. Which of the following statements are correct with respect to vital capacity?

- (a) It includes ERV, TV and IRV
- (b) Total volume of air a person can inspire after a normal expiration
- (c) The maximum volume of air a person can breathe in after forced expiration
- (d) It includes ERV, RV and IRV.
- (e) The maximum volume of air a person can breath out after a forced inspiration.

Choose the **most appropriate answer** from the options given below:

- (1) (b), (d) and (e) (2) (a), (c) and (d)
- (3) (a), (c) and (e) (4) (a) and (e)

168. A unique vascular connection between the digestive tract and liver is called _____.

- (1) Hepato–pancreatic system
- (2) Hepatic portal system
- (3) Renal portal system
- (4) Hepato–cystic system

169. Match **List-I** with **List-II** regarding the organs of Cockroach:

List-I	List-II
(a) Crop	(i) grinding the food particles
(b) Proventriculus	(ii) secretion of digestive juice
(c) Hepatic caecae	(iii) removal of nitrogenous waste
(d) Malpighian tubules	(iv) storage of food

Choose the **correct answer** from the options given below:

- (1) (a) – (iv), (b) – (i), (c) – (ii), (d) – (iii)
- (2) (a) – (iii), (b) – (ii), (c) – (i), (d) – (iv)
- (3) (a) – (ii), (b) – (iv), (c) – (i), (d) – (iii)
- (4) (a) – (i), (b) – (iv), (c) – (iii), (d) – (ii)

170. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)** :

Assertion (A) :

Spirulina is a microbe that can be used for reducing environmental pollution.

Reason (R) :

Spirulina is a rich source of protein, carbohydrates, fats, minerals and vitamins.

In the light of the above statements, choose the **most appropriate answer** from the options given below:

- (1) Both **(A)** and **(R)** are correct and **(R)** is the correct explanation of **(A)**
- (2) Both **(A)** and **(R)** are correct but **(R)** is not the correct explanation of **(A)**
- (3) **(A)** is correct but **(R)** is not correct
- (4) **(A)** is not correct but **(R)** is correct

171. Panspermia, an idea that is still a favourite for some astronomers, means :

- (1) Creation of life from dead and decaying matter
- (2) Creation of life from chemicals
- (3) Origin of sperm in human testes
- (4) Transfer of spores as unit of life from other planets of Earth



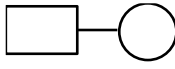
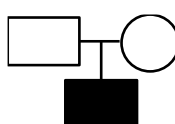
172. Arrange the components of mammary gland. (from proximal to distal)

- (a) Mammary duct
- (b) Lactiferous duct
- (c) Alveoli
- (d) Mammary ampulla
- (e) Mammary tubules

Choose the most appropriate answer from the options given below :

- (1) (c) → (a) → (d) → (e) → (b)
- (2) (b) → (c) → (e) → (d) → (a)
- (3) (c) → (e) → (a) → (d) → (b)
- (4) (e) → (c) → (d) → (b) → (a)

173. Select the **incorrect** match regarding the symbols used in Pedigree analysis:

- (1)  & Sex unspecified
 (2)  & Affected individual
 (3)  & Consanguineous mating
 (4)  & Parent with male child affected with disease

174. Why CNG is considered better fuel than diesel?

- (a) It can not be adulterated
 (b) It takes less time to fill the fuel tank
 (c) It burns more efficiently
 (d) It is cheaper
 (e) It is less inflammable.

Choose the **most appropriate answer** from the options given below

- (1) (a), (b), (c), (e) only
 (2) (a), (c), (d) only
 (3) (a), (b), (d), (e) only
 (4) (c), (d), (e) only

175. Which of the following methods is not commonly used for introducing foreign DNA into the plant cell?

- (1) Agrobacterium mediated transformation
 (2) Gene gun
 (3) 'Disarmed pathogen' vectors
 (4) Bacteriophages

176. Identify the region of human brain which has pneumotaxic centre that alters respiratory rate by reducing the duration of inspiration.

- (1) Medulla (2) Pons
 (3) Thalamus (4) Cerebrum

177. How many secondary spermatocytes are required to form 400 million spermatozoa ?

- (1) 50 million (2) 100 million
 (3) 200 million (4) 400 million

178. Choose the **correct** statement about a muscular tissue :

- (1) Skeletal muscle fibres are uninucleated and found in parallel bundles.
 (2) Intercalated discs allow the cardiac muscle cells to contract as a unit.
 (3) The walls of blood vessels are made up of columnar epithelium.
 (4) Smooth muscles are multinucleated and involuntary.

179. Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) :

FSH which interacts with membrane bound receptors does not enter the target cell.

Reason (R) :

Binding of FSH to its receptors generates second messenger (cyclic AMP) for its biochemical and physiological responses.

In the light of the above statements, choose **the most appropriate answer** from the options given below ;

- (1) Both **(A)** and **(R)** are correct and **(R)** is the correct explanation of **(A)**
 (2) Both **(A)** and **(R)** are correct but **(R)** is not the correct explanation of **(A)**
 (3) **(A)** is correct but **(R)** is not correct
 (4) **(A)** is not correct but **(R)** is correct

180. Which of the following animals has three chambered heart ?

- (1) *Scoliodon*
 (2) *Hippocampus*
 (3) *Chelone*
 (4) *Pteropus*

- 181.** Given below are two statements : one is **labelled** as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) :

During pregnancy the level of thyroxine is increased in the maternal blood.

Reason (R) :

Pregnancy is characterised by metabolic changes in the mother.

In the light of the above statements, choose **the most appropriate answer** from the options given below :

- (1) Both **(A)** and **(R)** are correct and **(R)** is the correct explanation of **(A)**
- (2) Both **(A)** and **(R)** are correct but **(R)** is not the correct explanation of **(A)**
- (3) **(A)** is correct but **(R)** is not correct
- (4) **(A)** is not correct but **(R)** is correct

- 182.** Select the **Incorrect** statements with respect to Cyclostomes :

- (a) They lack scales and paired fins.
- (b) They have circular mouth with Jaws.
- (c) They bear 6-15 pairs of gills.
- (d) They migrate to deep sea for spawning.

Choose **the most appropriate answer** from the options given below :

- (1) (a) and (b) only (2) (b) and (c) only
- (3) (b) and (d) only (4) (a) and (d) only

- 183.** Role of enamel is to :

- (1) Connect crown of tooth with its root.
- (2) Masticate the food.
- (3) Form bolus.
- (4) Give basic shape to the teeth.

- 184.** Choose the **correct** statements :

- (a) Bones support and protect softer tissues and organs
- (b) Weight bearing function is served by limb bones
- (c) Ligament is the site of production of blood cells.
- (d) Adipose tissue is specialised to store fats.
- (e) Tendons attach one bone to another.

Choose **the most appropriate answer** from the options given below :

- (1) (a), (b) and (d) only (2) (b), (c) and (e) only
- (3) (a), (c) and (d) only (4) (a), (b) and (e) only

- 185.** Bivalent or Tetrad formation is a characteristic feature observed during :

- (1) Synaptonemal complex in zygotene stage
- (2) Chiasmata in Diplotene stage
- (3) Synaptonemal complex in Pachytene stage
- (4) Chiasmata in zygotene stage

Zoology : Section-B (Q. No. 186 to 200)

- 186.** Which of the following are true about the taxonomical aid 'key' ?

- (a) Keys are based on the similarities and dissimilarities.
- (b) Key is analytical in nature.
- (c) Keys are based on the contrasting characters in pair called couplet.
- (d) Same key can be used for all taxonomic categories.
- (e) Each statement in the key is called Lead.

Choose **the most appropriate answer** from the options given below :

- (1) (a), (b) and (c) only
- (2) (b), (c) and (d) only
- (3) (a), (b), (c) and (e) only
- (4) (a), (c), (d) and (e) only

- 187.** A normal girl, whose mother is haemophilic marries a male with no ancestral history of haemophilia. What will be the possible phenotypes of the offsprings ?

- (a) Haemophilic son and haemophilic daughter.
- (b) Haemophilic son and carrier daughter.
- (c) Normal daughter and normal son.
- (d) Normal son and haemophilic daughter.

Choose **the most appropriate answer** from the options given below :

- (1) (a) and (b) only (2) (b) and (c) only
- (3) (a) and (d) only (4) (b) and (d) only

- 188.** IUDs are small objects made up of plastic or copper that are inserted in the uterine cavity. Which of the following statements are **correct** about IUDs ?

- (a) IUDs decrease phagocytosis of sperm within the uterus.
- (b) The released copper ions suppress the sperm motility.
- (c) IUDs do not make the cervix hostile to the sperm.
- (d) IUDs suppress the fertilization capacity of sperm.
- (e) The IUDs require surgical intervention for their insertion in the uterine cavity.

Choose **the most appropriate answer** from the options given below :

- (1) (a), (d) and (e) only (2) (b) and (c) only
- (3) (b) and (d) only (4) (d) only

189. Refer to the following statements for agarose-gel electrophoresis :

- (a) Agarose is a natural polymer obtained from sea-weed.
- (b) The separation of DNA molecules in agarose-gel electrophoresis depends on the size of DNA.
- (c) The DNA migrates from negatively-charged electrode to the positively-charged electrode
- (d) The DNA migrates from positively-charged electrode to the negatively-charged electrode.

Choose **the most appropriate answer** from the options given below :

- (1) (a) and (b) only
- (2) (a), (b) and (c) only
- (3) (a), (b) and (d) only
- (4) (b), (c) and (d) only

190. Match **List - I** with **List - II**

List - I	List - II
(a) Multipolar neuron	(i) Somatic neural system
(b) Bipolar neuron	(ii) Cerebral cortex
(c) Myelinated nerve fibre	(iii) Retina of Eye
(d) Unmyelinated nerve fibre	(iv) Spinal nerves

Choose the **correct answer** from the options given below :

- (1) (a) – (iii), (b) – (i), (c) – (iv), (d) – (ii)
- (2) (a) – (ii), (b) – (iv), (c) – (iii), (d) – (i)
- (3) (a) – (ii), (b) – (iii), (c) – (i), (d) – (iv)
- (4) (a) – (ii), (b) – (iii), (c) – (iv), (d) – (i)

191. Excretion in cockroach is performed by all, EXCEPT :

- (1) Urecoase glands
- (2) Malpighian tubules
- (3) Fat body
- (4) Hepatic caeca

192. Select the **correct** statement regarding mutation theory of evolution.

- (1) This theory was proposed by Alfred Wallace
- (2) Variations are small directional changes
- (3) Single step large mutation is a cause of speciation
- (4) Large differences due to mutations arise gradually in a population

193. Arrange the following formed elements in the decreasing order of their abundance in blood in humans :

- (a) Platelets
- (b) Neutrophils
- (c) Erythrocytes
- (d) Eosinophils
- (e) Monocytes

Choose **the most appropriate answer** from the options given below :

- (1) (c), (a), (b), (e), (d)
- (2) (c), (b), (a), (e), (d)
- (3) (d), (e), (b), (a), (c)
- (4) (a), (c), (b), (d), (e)

194. In the enzyme which catalyses the breakdown of:



the prosthetic group is :

- (1) Nicotinamide adenine dinucleotide
- (2) Haem
- (3) Zinc
- (4) Niacin

195. Against the codon 5' UAC 3', what would be the sequence of anticodon on tRNA ?

- (1) 5' AUG 3'
- (2) 5' ATG 3'
- (3) 5' GTA 3'
- (4) 5' GUA 3'

196. Select the **correct** statements.

- (a) Angiotensin II activates the cortex of adrenal gland to release aldosterone.
- (b) Aldosterone leads to increase in blood pressure.
- (c) ANF acts as a check on renin-angiotensin mechanism.
- (d) ADH causes vasodilation.
- (e) Vasopressin is released from adenohypophysis.

Choose **the most appropriate answer** from the options given below :

- (1) (a), (b) and (e) only
- (2) (c), (d) and (e) only
- (3) (b), (c) and (d) only
- (4) (a), (b) and (c) only

197. With respect to metaphase, which of the following statements is incorrect ?

- (1) Complete disintegration of nuclear envelope takes place
- (2) Chromosomes are highly condensed
- (3) Metaphase chromosomes are made up of four sister chromatids held together by centromere
- (4) Chromosomes lie at the equator of the cell

198. Select the **incorrect** statement with respect to inbreeding of animals.

- (1) It is used for evolving pure lines in cattle.
- (2) It helps in accumulation of superior genes and elimination of less desirable genes.
- (3) It decreases homozygosity.
- (4) It exposes harmful recessive genes that are eliminated by selection.

199. Match **List - I** with **List - II** :

List - I

List - II

- | | |
|---------------------------|---------------------------|
| (a) Cellular barrier | (i) Interferons |
| (b) Cytokine barrier | (ii) Mucus |
| (c) Physical barrier | (iii) Neutrophils |
| (d) Physiological barrier | (iv) HCl in gastric juice |

Choose the **correct** answer from the options given below :

- (1) (a) - (ii), (b) - (iii), (c) - (iv), (d) - (i)
- (2) (a) - (ii), (b) - (iii), (c) - (i), (d) - (iv)
- (3) (a) - (iii), (b) - (iv), (c) - (ii), (d) - (i)
- (4) (a) - (iii), (b) - (i), (c) - (ii), (d) - (iv)

200. If A and C make 30% and 20% of DNA, respectively, what will be the percentage composition of T and G ?

- (1) T : 20%, G : 30%
- (2) T : 30%, G : 20%
- (3) T : 30%, G : 30%
- (4) T : 20%, G : 20%

ANSWER KEY

NEET(UG)-2022 (RE-EXAMINATION)

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	1	4	3	1	3	3	1	4	3	3	2	1	1	1	4
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	1	3	3	4	3	3	1	1	4	4	3	2	2	2	2
Que.	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Ans.	3	1	1	3	1	4	4	2	1	2	1	3	3	3	3
Que.	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ans.	1	4	1	1	3	1	1	2	3	2	4	3	1	1	3
Que.	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Ans.	2	2	1	3	2	2	3	3	2	2	4	1	2	1	3
Que.	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
Ans.	3	1	4	1	1	4	3	4	3	4	4	4	1	3	4
Que.	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105
Ans.	1	3	3	1	3	2	4	2	2	4	3	1	1	4	1
Que.	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
Ans.	2	2	1	2	3	2	4	1	4	2	2	4	1	1	2
Que.	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135
Ans.	2	4	2	2	1	4	1	3	3	3	2	3	2	2	3
Que.	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
Ans.	2	1	3	1	3	3	2	3	2	2	4	3	2	3	3
Que.	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165
Ans.	2	2	2	1	4	3	2	4	1	2	2	2	1	3	3
Que.	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
Ans.	1	3	2	1	2	4	3	3	2	4	2	3	2	2	3
Que.	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195
Ans.	1	3	2	1	1	3	2	3	2	4	4	3	1	2	4
Que.	196	197	198	199	200										
Ans.	4	3	3	4	2										

HINT - SHEET

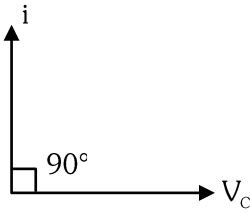
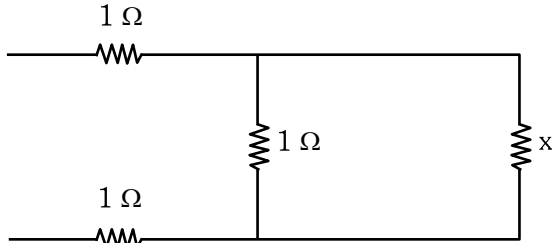
- $e^{-\omega t}$ represents non-periodic motion.
- $B = 3 \times 10^{-8} \cos(1.6 \times 10^3 x + 48 \times 10^{10} t)$
 $C = \frac{\omega}{k} = \frac{48 \times 10^{10}}{1.6 \times 10^3} = 3 \times 10^8 \text{ m/s}$
 $C = E_0 / B_0$
 $E = 3 \times 10^{-8} \times 3 \times 10^8 = 9 \text{ N/C}$
 $\therefore E = 9 \cos(1.6 \times 10^3 x + 48 \times 10^{10} t)$
- For zener diode \rightarrow Doping is high
 & Depletion region is thin
 & It is operated in Reverse Bias region
 & Zener voltage (V_z) is constant

4.

$i = \frac{4}{7.5 + 0.5}$
 $= 0.5 \text{ A}$

$\text{TPD} = 4 - 0.5 \times 0.5$
 $= 4 - 0.25$
 $\text{TPD} = 3.75 \text{ volt}$

5.

6. If effective resistance is x ,

$$\Rightarrow x = 1 + \frac{x \times 1}{x + 1} + 1$$

$$\Rightarrow (x - 2) = \frac{x}{x + 1}$$

$$\Rightarrow x^2 - x - 2 = x$$

$$\Rightarrow x^2 - 2x - 2 = 0$$

$$\text{So, } x = \frac{2 \pm \sqrt{12}}{2} = 1 \pm \sqrt{3} \Omega$$

neglecting negative value, $x = 1 + \sqrt{3} \Omega$

7.

$$H = \frac{u^2 \sin^2 \theta}{2g} = \frac{(20)^2 \sin^2 30^\circ}{2(10)}$$

$$= 5\text{m}$$

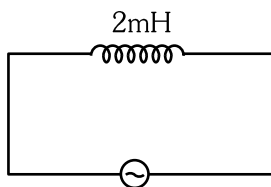
8.

$$B = \frac{\mu_0 N i}{2R}$$

$$= \frac{4\pi \times 10^{-7} \times 1000 \times 1}{2 \times 62.8 \times 10^{-2}}$$

$$= \frac{4 \times 3.14 \times 10^{-7} \times 10^3}{2 \times 62.8 \times 10^{-2}} = 10^{-3} \text{ T}$$

9.



200V, 50Hz

For AC $X_L = \omega L$ For DC, $\omega = 0$

$$X_1 = 100\pi \times 2 \times 10^{-3} \quad X_L = \omega L$$

$$X_1 = 0.2 \pi \Omega \quad X_2 = 0$$

$$X_1 = 0.628 \Omega$$

10. Secondary Rainbow is due to double internal reflection and it is formed above the Primary Rainbow.

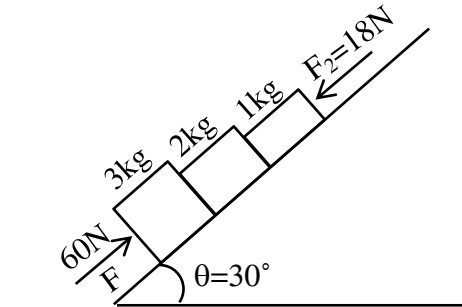
$$11. \text{ KE} = h\nu - \phi$$

$$eV_0 = h\nu - \phi$$

$$eV_0 = 4.2 \text{ eV} - 2.2 \text{ eV}$$

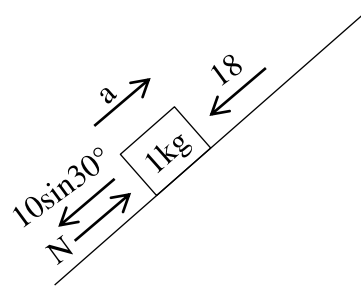
$$\Rightarrow V_0 = 2 \text{ Volts}$$

12.



$$a = \frac{\text{Net force}}{\text{Total mass}} = \frac{60 - (18 + 60 \sin 30^\circ)}{6} = 2 \text{ ms}^{-2}$$

FBD of 1kg



$$N - 18 - 5 = 1(2)$$

$$N = 25 \text{ N}$$

13. Here, current flows when any of the switch is in ON (1) state.

A	B	LED
0	0	0
0	1	1
1	0	1
1	1	1

OR Gate

14. Pressure depends on height above base only which is same for two vessels.

$$15. C = \frac{\epsilon_0 A}{d}$$

$$\text{Now, } C' = \frac{\epsilon_0 (A/2)}{2d} = \frac{\epsilon_0 A}{4d} = \frac{C}{4}$$

$$16. F = 6 \pi \eta r v$$

$$= 6 \times 3.14 \times 0.9 \times 5 \times 10^{-3} \times 10 \times 10^{-2}$$

$$= 847.8 \times 10^{-5} \text{ N}$$

$$= 8.48 \times 10^{-3} \text{ N}$$

17. $\vec{F} = 2\hat{i} + \hat{j} - \hat{k}$ $\vec{r} = 3\hat{i} + 2\hat{j} - 2\hat{k}$

$$\vec{F} \cdot \vec{r} = 6 + 2 + 2 = 10$$

$$\vec{F} \times \vec{r} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 2 & 1 & -1 \\ 3 & 2 & -2 \end{vmatrix}$$

$$= \hat{i}(0) - \hat{j}(-1) + \hat{k}(1)$$

$$= \hat{j} + \hat{k}$$

$$|\vec{F} \times \vec{r}| = \sqrt{2}$$

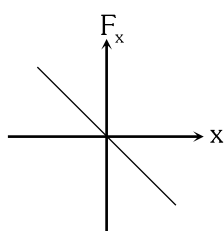
18. According to Malus law
 $I_2 = I_1 \cos^2 \theta$
 Where I_1 is incident Polarised light

$$I_2 = I \cos^2 30 = I \left(\frac{\sqrt{3}}{2} \right)^2$$

$$I_2 = \frac{3I}{4}$$

19. Restoring force of spring is
 $F = -kx$

$$F \propto -x$$



20. Linear fringe width is given as $= \frac{\lambda D}{d}$
 When Screen is moving away from slits then D increases, so that fringe width increases.

21. $\frac{C_1 C_2}{C_1 + C_2} = 3$

$$C_1 + C_2 = 16$$

$$C_1 C_2 = 48$$

$$C_1 = 12 \mu F$$

$$C_2 = 4 \mu F$$

22. $mv = 0.3$

$$\frac{5}{1000} v = 0.3 \Rightarrow v = 60 \text{ m/s}$$

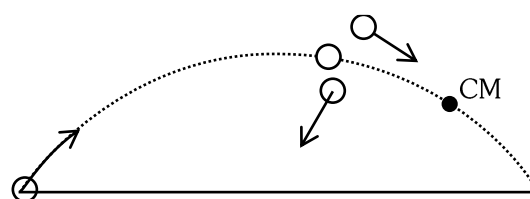
$$\text{Distance covered} = vt$$

$$= 60 \times 5 = 300 \text{ m}$$

23. Gravitational force is a conservative force so W.D. is independent of path taken between two points.

24. $\text{Conductance} = \frac{1}{\text{Resistance}}$

25.



After explosion C.O.M. moving is the same path but particles moving in different direction.

26. $(KE)_{\max} = h\nu - h\nu_{Th}$

$$(KE)_{\max} = h(4\nu_0) - h\nu_0$$

$$= 3 h\nu_0$$

27. $\frac{B_0}{E_0} = \frac{1}{c} = \sqrt{\mu_0 \epsilon_0}$

28. Straight current carrying wire produces circular magnetic field.

29. (a) \rightarrow (iv) Amplitude is continuously decreasing

(b) \rightarrow (iii) $F \propto -x$

(c) \rightarrow (ii) Amplitude is constant

(d) \rightarrow (i) $K.E. + P.E. = M.E. = \text{constant}$

30. Since, $dN = -\lambda N dt$

$(dN \propto N)$ statement I is wrong.

$T_{1/2}$ = time in which active no. of nuclei becomes

half therefore statement II is wrong.

31. $PV^2 = C$

$$\Rightarrow \frac{nRT}{V} V^2 = C$$

$$\Rightarrow TV = \text{constant}$$

$$\therefore V_2 > V_1 \Rightarrow T_1 > T_2$$

32. $I_{\text{rms}} V_{\text{rms}} = P$

$$I_{\text{rms}} \times 200 = 100$$

$$I_{\text{rms}} = \frac{1}{2}$$

$$\text{So, } I_{\text{peak}} = I_{\text{rms}} \sqrt{2} = \frac{1}{2} \times \sqrt{2}$$

$$= \frac{1}{\sqrt{2}} = 0.707 \text{ A}$$

33. $R(n) = 0.529 \frac{n^2}{z}$

$$\frac{R_1(n=2)}{R_2(n=4)} = \frac{2^2}{4^2} = \frac{1}{4} = 0.25$$

34. $Y = \frac{\text{stress}}{\text{strain}}$ (Strain is dimensionless)

$\therefore [Y] = [\text{stress}] = [\text{Pressure}]$

35. $\omega_i = 60 \text{ rpm} = 60 \times \frac{2\pi}{60} = 2\pi \text{ rad/s}$

$\omega_f = 360 \text{ rpm} = 360 \times \frac{2\pi}{60} = 12\pi \text{ rad/s}$

$\Delta \text{K.E.} = \frac{1}{2} I (\omega_f^2 - \omega_i^2) = 484$

$\frac{1}{2} I (144\pi^2 - 4\pi^2) = 484$

$I \approx 0.7 \text{ kg-m}^2$

36. $\phi = 2t^3 + 4t^2 + 2t + 5$

$\text{emf} = \left| \frac{d\phi}{dt} \right| = 6t^2 + 8t + 2$

$= 6 \times 5^2 + 8 \times 5 + 2$

$= 192 \text{ V}$

37. $f_0 = 20 \text{ m} = 2000 \text{ cm}$

$f_e = 2 \text{ cm}$

for Normal adjustment

$\rightarrow \text{M.P.} = -\frac{f_0}{f_e} = \frac{-2000}{2} = -1000$

$\rightarrow \text{Distance between both lens} = f_0 + f_e$
 $= 2000 + 2$
 $= 2002 \text{ cm}$
 $= 20.02 \text{ m}$

\rightarrow Image is inverted and magnified

\rightarrow Aperture of eye piece is smaller than objective.

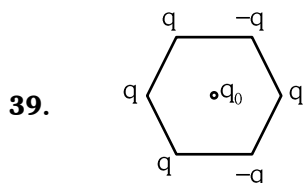
38. $N_1(10\lambda) = N_0 e^{-10\lambda t}$

$N_2(\lambda) = N_0 e^{-\lambda t}$

Ratio $\frac{N_1}{N_2} = \frac{N_0 e^{-10\lambda t}}{N_0 e^{-\lambda t}} = \frac{1}{e}$

$\Rightarrow e^{-9\lambda t} = e^{-1}$

or $t = \frac{1}{9\lambda}$



Work = $U_f - U_i$

$= 0 - 0$

Work = 0

40. $\frac{n_1}{n_2} = \frac{v_1}{v_2}$
 $\frac{400}{n_2} = \frac{v_1}{4\ell}$

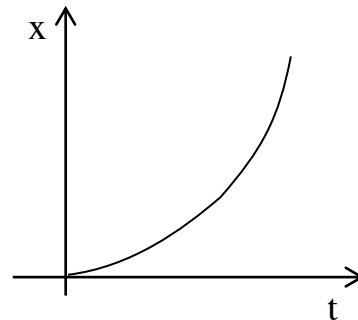
$\frac{400}{n_2} = \frac{v_1}{v_2} \left[\text{from } v \propto \sqrt{T} \right]$

$\frac{400}{n_2} = \sqrt{\frac{T_1}{T_2}}$

$\frac{400}{n_2} = \sqrt{\frac{300}{363}}$

$\Rightarrow n_2 = 440 \text{ Hz}$

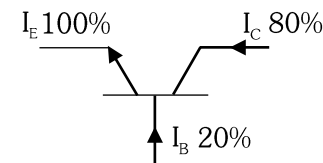
41.



$x = \frac{1}{2} at^2$ (if coefficients of t^2 is positive ($a > 0$))

upward opening parabola)

42.



$I_C = 24 \text{ mA}$

and $I_E = \frac{I_C}{\alpha}$

$I_E = \frac{24 \text{ mA}}{0.8} = 30 \text{ mA}$

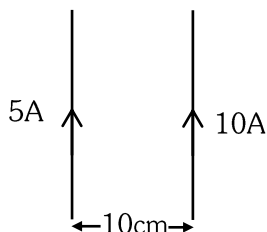
$\therefore I_B = I_E - I_C$
 $= 6 \text{ mA (into the base)}$

43. $V_{\text{rms}} = \sqrt{\frac{3KT}{m}} \propto \frac{1}{\sqrt{m}}$
 $= \text{maximum for He}$

44. $V = -\frac{K}{x}$

$E_x = -\frac{dV}{dx} = K \frac{d(x^{-1})}{dx}$
 $= \frac{-K}{x^2} = \frac{-K}{2^2} = -\frac{K}{4}$

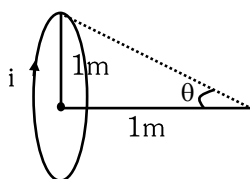
45.



$$\frac{F_M}{\ell} = \frac{\mu_0 i_1 i_2}{2\pi r}$$

$$= \frac{4\pi \times 10^{-7} \times 5 \times 10}{2\pi \times 0.1} = 10^{-4} \text{ N/m}$$

46.



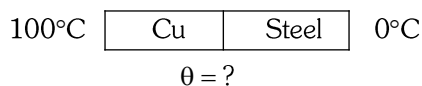
$$B_A = B_0 \sin^3 \theta$$

$$= \frac{\mu_0 i}{2R} \times \sin^3 \theta$$

$$= \frac{4\pi \times 10^{-7} \times \sqrt{2}}{2 \times 1} \times \left(\frac{1}{2\sqrt{2}} \right)$$

$$B_A = 3.14 \times 10^{-7} \text{ T}$$

47.



$$\frac{\Delta Q}{\Delta t} = \frac{385A(100 - \theta)}{\ell} = \frac{50A(\theta - 0)}{\ell}$$

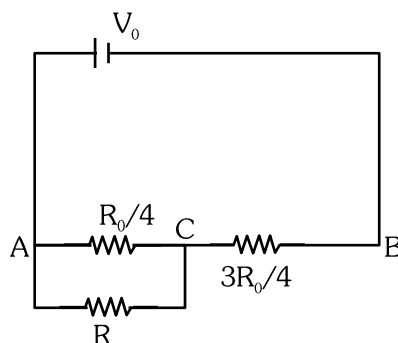
$$\Rightarrow 77(100 - \theta) = 10\theta$$

$$\Rightarrow 7700 - 77\theta = 10\theta$$

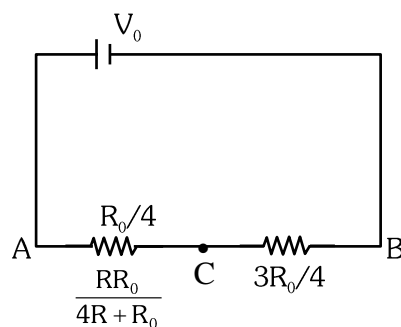
$$\Rightarrow 87\theta = 7700$$

$$\Rightarrow \theta = \frac{7700}{87} = 88.5^\circ\text{C}$$

48.



\Rightarrow



In series, potential divides in direct ratio of resistance,

$$\text{So, } V_{AC} = \frac{R_{AC}}{R_{AC} + R_{CB}} V_0$$

$$= \frac{\frac{RR_0}{4R + R_0}}{\frac{RR_0}{4R + R_0} + \frac{3R_0}{4}} \times V_0 = \frac{4RV_0}{16R + 3R_0}$$

49.

$$\frac{F_e}{F_g} = \frac{\frac{Kq_1q_2}{r^2}}{\frac{Gm_1m_2}{r^2}}$$

$$2.4 \times 10^{39} = \frac{K}{G} \times \frac{(1.6 \times 10^{-19})^2}{(9.11 \times 10^{-31} \times 1.67 \times 10^{-27})}$$

$$\frac{K}{G} = \frac{2.4 \times 10^{39} \times 15.2137 \times 10^{-58}}{2.56 \times 10^{-38}}$$

$$= 14.26 \times 10^{19}$$

$$= 1.426 \times 10^{20}$$

$$\approx 10^{20}$$

50.

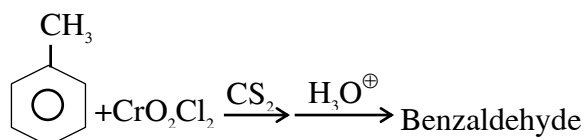
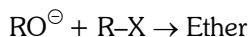
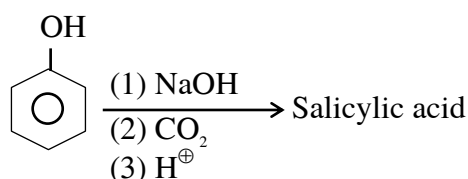
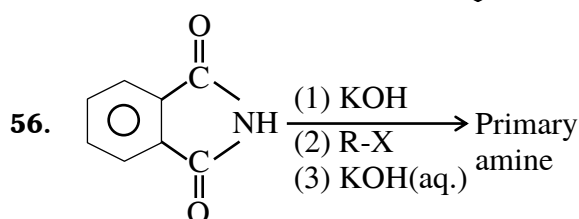
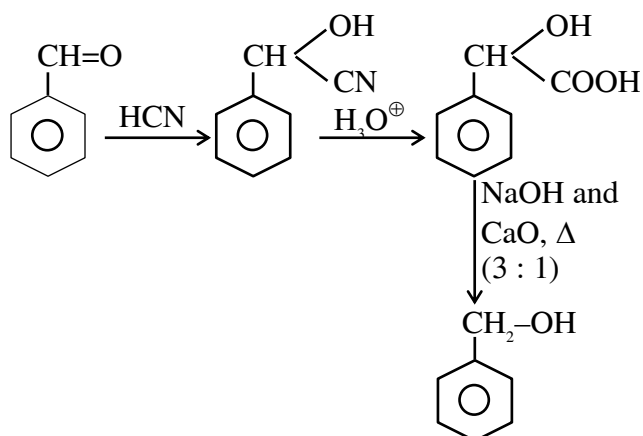
$$g = \frac{4\pi^2 L}{T^2}$$

$$\frac{\Delta g}{g} = \frac{\Delta L}{L} + 2 \frac{\Delta T}{T}$$

$$\% \text{ error in } g = \frac{0.1}{10} \times 100 + 2 \left(\frac{1}{100} \right) \times (100)$$

$$= 3\%$$

51. Bond angle \propto % s-Ch.
Bond angle $\propto \frac{1}{\text{no. of L.P.}}$ (if hybridisation is same)
52. Greater the value of K_H for a gas, lesser is its solubility in water. So, order of solubility of gases in water is –
 $\text{Ar} < \text{CO}_2 < \text{CH}_4 < \text{HCHO}$
53. Ostwald process for formation of nitric acid.
54. Bleaching powder composition
 $\text{Ca(OH)}_2 \cdot \text{CaCl}_2 \cdot \text{Ca(OC}_2\text{O}_2\text{)}_2 \cdot 2\text{H}_2\text{O}$
- 55.



57. Sodium laurylsulphate → Anionic detergent
Cetyltrimethyl ammonium chloride → Cationic detergent
Sodium stearate → Toilet soap
Polyethyleneglycol stearate → Non-ionic detergent

58. $2\text{Pb(NO}_3)_2(\text{s}) \xrightarrow{\Delta} 2\text{PbO}(\text{s}) + 4\text{NO}_2(\text{g}) + \text{O}_2(\text{g})$
59. 2nd I.E. of alkali metals much higher than that of alkaline earth metal, due to noble gas configuration.
60. $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Cl} > (\text{CH}_3)_2\text{CHCH}_2\text{Cl} > \text{CH}_3\text{CH}_2\text{CH}(\text{Cl})\text{CH}_3 > (\text{CH}_3)_3\text{CCl}$

Rate of $\text{S}_\text{N}2 \propto \frac{1}{\text{Steric Hindrance}}$

61. NH_3 – sp^3 (1 LP) – Trigonal pyramidal
 ClF_3 – sp^3d (2 LP) – T-shape
 PCl_5 – sp^3d (0 LP) – Trigonal bipyramidal
 BrF_5 – sp^3d^2 (1 LP) – Square pyramidal
(a) – (iii), (b) – (iv), (c) – (ii), (d) – (i)

62. Polythene → Thermoplastic polymer

63. Borax – $\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$

Kernite – $\text{Na}_2\text{B}_4\text{O}_7 \cdot 4\text{H}_2\text{O}$
ortho boric acid – H_3BO_3
Borax bead – NaBO_2

(a) – (iv), (b) – (ii), (c) – (iii), (d) – (i)

64. $E^\circ_{\text{Co}^{+2}/\text{Co}^{+3}} = -1.81\text{V} \Rightarrow E^\circ_{\text{Co}^{+3}/\text{Co}^{+2}} = 1.81\text{V}$

$E^\circ_{\text{Al}/\text{Al}^{+3}} = +1.66\text{V} \Rightarrow E^\circ_{\text{Al}^{+3}/\text{Al}} = -1.66\text{V}$

For feasible redox reaction :

$E^\circ_{\text{cell}} = (\text{SRP})_{\text{cathode}} - (\text{SRP})_{\text{anode}}$

$E^\circ_{\text{cell}} = 1.81 - (-1.66)$

$E^\circ_{\text{cell}} = +3.47\text{V}$

65. Uses of hydrogen

66. $\text{Na}_2\text{B}_4\text{O}_7 \xrightarrow{\Delta} \underset{(x)}{\text{B}_2\text{O}_3} + \text{NaBO}_2$

67. Correct order of I.E. $\text{C} < \text{O} < \text{N} < \text{F}$

Half filled sp^3 configuration

68. For CH_3COOH :

$[\text{H}^+] = \text{C} \cdot \alpha$

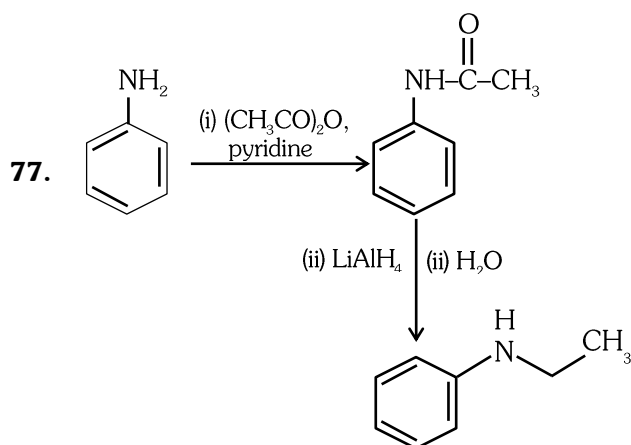
$[\text{H}^+] = 10^{-2} \times \frac{1}{100} = 10^{-4}\text{M}$

$\text{pH} = -\log[\text{H}^+]$

$\text{pH} = -\log 10^{-4}$

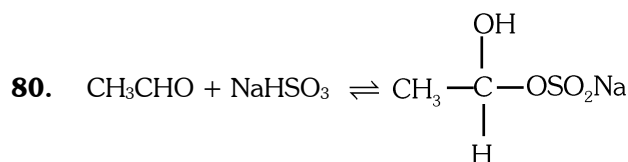
$\text{pH} = 4$

69. With increase in temperature x/m decreases, so, correct order of temperature is – $T_3 > T_2 > T_1$
70. $k = \frac{2.303}{t} \log \frac{[A]_0}{[A]_t}$
 $\frac{0.693}{2000} = \frac{2.303}{8000} \log \frac{[A]_0}{0.02}$
 $\therefore [A]_0 = 0.32 \text{ M}$
71. For isothermal expansion of an ideal gas $\Delta U = 0$
72. $\text{OHC}-\overset{5}{\text{CH}}=\overset{4}{\text{CH}}-\overset{3}{\text{CH}}-\overset{2}{\text{CH}_2}-\overset{1}{\text{COOCH}_3}$
 $\downarrow \quad \downarrow$
 $sp^3 \quad sp^2$
73. mass = $2.5 \text{ mL} \times 2.15 \text{ mL}^{-1} = 5.375 \text{ g}$
 \therefore In correct significant figures, mass = 5.4 g
74. Strong oxidising nature of F_2 is high to low bond dissociation enthalpy of $\text{F}-\text{F}$ due to (L.P. – L.P. repulsion & max. extent of hydration enthalpy of small sized F^- ion.
75. (a) $[\text{Co}(\text{NH}_3)_5\text{NO}_2]\text{Cl}_2$ and $[\text{Co}(\text{NH}_3)_5\text{ONO}]\text{Cl}_2$
 - linkage isomerism (iii)
 (b) $[\text{Cr}(\text{NH}_3)_6]$ $[\text{Co}(\text{CN})_6]$ and $[\text{Cr}(\text{CN})_6]$
 $[\text{Co}(\text{NH}_3)_6]$
 - coordination isomerism (ii)
 (c) $[\text{Co}(\text{NH}_3)_5\text{SO}_4]\text{Br}$ and $[\text{Co}(\text{NH}_3)_5\text{Br}]\text{SO}_4$
 - ionisation isomerism (i)
 (d) $[\text{Cr}(\text{H}_2\text{O})_6\text{Cl}_3]$ and $[\text{Cr}(\text{H}_2\text{O})_5\text{Cl}]\text{Cl}_2 \cdot \text{H}_2\text{O}$
 - solvate isomerism (iv)
 (a) – (iii), (b) – (ii), (c) – (i), (d) – (iv)
76. Correct statement about denaturation of proteins:
 \rightarrow It results due to change of temperature and/or pH.
 \rightarrow It results in loss of biological activity of proteins.
 \rightarrow Uncoiling of the helical structure takes place.

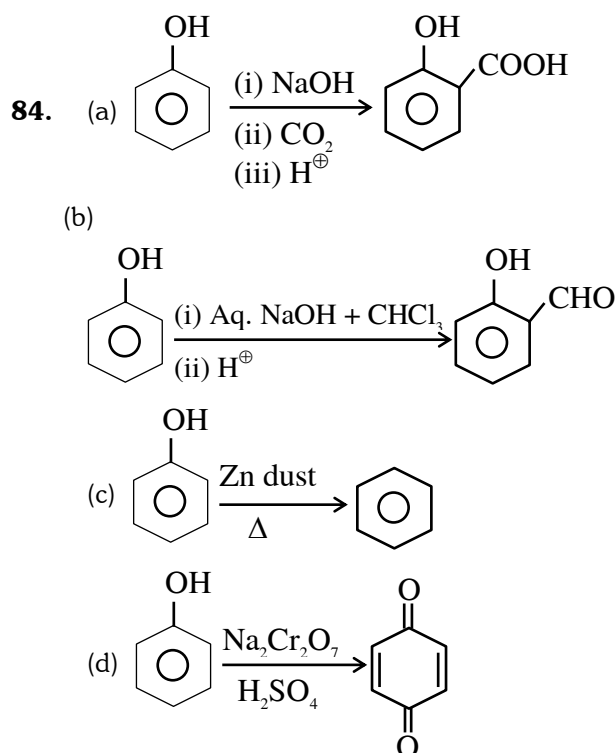


78. a-(iv), b-(iii), c-(i), d-(ii)

79. Chlorine is an electron withdrawing group but it is ortho, para directing in electrophilic aromatic substitution because Inductive effect of chlorine destabilises the intermediate carbocation formed during the electrophilic substitution, however due to the more pronounced resonance effect, the halogen stabilises the carbocation at ortho and para positions.



- Nucleophilic addition reaction.
81. The gases having higher critical temperature can be easily liquefied.
 Hence, among the given gases NH_3 has the highest critical temperature. Therefore, it will be liquefied first.
82. 5f have poor shielding effect so more will be Z_{eff}
 At. size $\propto \frac{1}{Z_{\text{eff}}}$
83. Heptane : 371.4 K
 Hexane : 341.9 K
 2-Methylbutane : 300.9 K
 Butane : 272.4 K
 2-Methylpropane : 261 K



85.

	(Quantum number)		(Orbital)
(a)	$n = 2, \ell = 1$	(iii)	2 p
(b)	$n = 3, \ell = 2$	(iv)	3 d
(c)	$n = 3, \ell = 0$	(ii)	3 s
(d)	$n = 2, \ell = 0$	(i)	2 s

(a)-(iii), (b)-(iv), c-(ii), (d)-(i)

86. It is a displacement reaction not calcination.

87. Energy of a 300 nm photon is given by \Rightarrow

$$E = \frac{hc}{\lambda} = \frac{6.626 \times 10^{-34} \text{ Js} \times 3 \times 10^8 \text{ ms}^{-1}}{300 \times 10^{-9} \text{ m}}$$

$$= 6.626 \times 10^{-19} \text{ J}$$

Energy of one mole of photons

$$= 6.626 \times 10^{-19} \text{ J} \times 6.022 \times 10^{23} \text{ mol}^{-1}$$

$$= 3.99 \times 10^5 \text{ J mol}^{-1}$$

The minimum energy needed to remove one mole of electrons = $(3.99 - 1.68) \times 10^5 \text{ J mol}^{-1}$
 $= 2.31 \times 10^5 \text{ J mol}^{-1}$

88. Rate of Reaction = $\frac{1}{4} \times$ Rate of disappearance

$$\text{of A} = \frac{1}{4} \times 4 \times 10^{-2} = 1 \times 10^{-2} \text{ mol L}^{-1} \text{ s}^{-1}$$

$$\text{Rate of reaction} = \frac{1}{3} \text{ Rate of disappearance of B}$$

 \therefore Rate of disappearance of

$$\begin{aligned} \text{B} &= 3 \times \text{Rate of reaction} \\ &= 3 \times 1 \times 10^{-2} \\ &= 3 \times 10^{-2} \text{ mol L}^{-1} \text{ s}^{-1} \end{aligned}$$

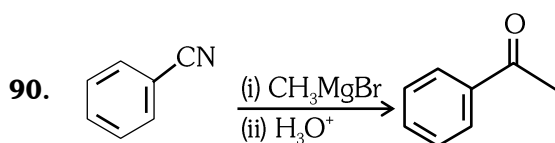
Now, Rate of disappearance of

$$\text{B} = \frac{\text{change in concentration of B}}{\text{Time taken}}$$

$$3 \times 10^{-2} = \frac{\text{change in concentration of B}}{10}$$

$$\therefore \text{change of conc. of B} = 3 \times 10^{-2} \times 10$$

$$= 30 \times 10^{-2} \text{ mol L}^{-1}$$

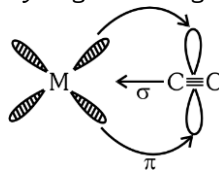
89. $\text{R-X} \xrightarrow{\text{Aq. KOH}} \text{R-OH}$ 91. $\text{Fe}_{0.96} \text{O}$ Let, No. of ions of $\text{Fe}^{+2} = x$ No. of ions of $\text{Fe}^{+3} = 0.96 - x$ Now, $(x)(+2) + (0.96 - x)(+3) + 1(-2) = 0$

$$2x + 2.88 - 3x - 2 = 0$$

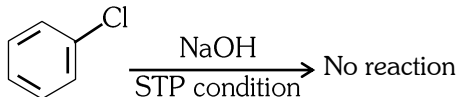
$$x = 0.88$$

$$\therefore \text{Fraction of } \text{Fe}^{+3} \text{ ions} = \frac{0.08}{0.96} = \frac{1}{12}$$

92. Synergic bonding



93.



94.

$$\text{Moles of Dioxygen gas} = \frac{3.2 \text{ g}}{32 \text{ g mol}^{-1}} = 0.1 \text{ mol}$$

$$\text{volume of Dioxygen gas at STP} = 0.1 \times 22.4$$

$$= 2.24 \text{ L}$$

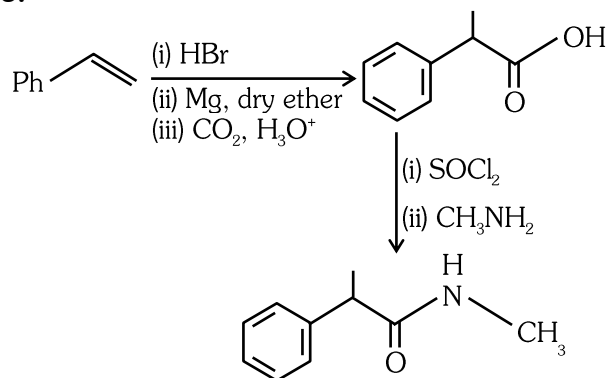
At constant temperature

$$P_1 V_1 = P_2 V_2$$

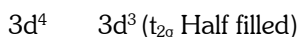
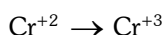
$$1 \times 2.24 = \frac{1}{3} \times V_2$$

$$V_2 = 6.72 \text{ L}$$

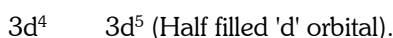
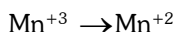
95.



97.

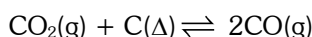


(R.A.)



(O.A.)

98.



$$K_p = K_c \cdot (RT)^{\Delta n_g}$$

$$3 = K_c \cdot (0.083 \times 1000)^1$$

$$\therefore K_c = 3.6 \times 10^{-2}$$

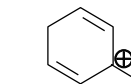
99.

$$\Delta G^\circ = -nF \cdot E^\circ_{\text{cell}}$$

$$\Delta G^\circ = \frac{-2 \times 96487 \times 1.1}{1000}$$

$$\Delta G^\circ = -212.27 \text{ kJ mol}^{-1}$$

100.

 3° Cation + resonance stabilized.

NEET(UG) – 2022 (Overseas)

Section-A (Physics)

- The de Broglie wavelength of a thermal electron at 27°C is λ . When the temperature is increased to 927°C , its de-Broglie wavelength will become:
 - 4λ
 - $\frac{\lambda}{2}$
 - $\frac{\lambda}{4}$
 - 2λ
- The ratio of the radii of two circular coils is $1 : 2$. The ratio of currents in the respective coils such that the same magnetic moment is produced at the centre of each coil:
 - $2 : 1$
 - $1 : 2$
 - $1 : 4$
 - $4 : 1$
- The current in an inductor of self inductance 4 H changes from 4 A to 2 A in 1 second . The e.m.f. induced in the coil is:
 - 2 V
 - -4 V
 - 8 V
 - -2 V
- An electromagnetic wave is moving along negative $z(-z)$ direction and at any instant of time, at a point, its electric field vector is $3\hat{j}\text{ V/m}$. The corresponding magnetic field at that point and instant will be:

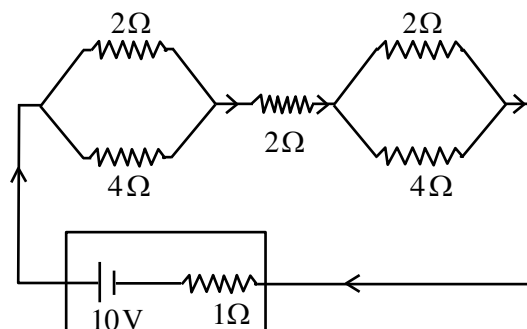
(Take $c = 3 \times 10^8\text{ ms}^{-1}$)

 - $-10\hat{i}\text{ nT}$
 - $\hat{i}\text{ nT}$
 - $-\hat{i}\text{ nT}$
 - $10\hat{i}\text{ nT}$
- Two amplifiers of voltage gain 20 each, are cascaded in series. If 0.01 volt a.c. input signal is applied across the first amplifier, the output a.c. signal of the second amplifier in volt is:
 - 4.0
 - 0.01
 - 0.20
 - 2.0
- A linearly polarised monochromatic light of intensity 10 lumen is incident on a polarizer. The angle between the direction of polarisation of the light and that of the polariser such that the intensity of output light is 2.5 lumen is:
 - 75°
 - 30°
 - 45°
 - 60°

- A stone is thrown vertically downward with an initial velocity of 40 m/s from the top of a building. If it reaches the ground with velocity 60 m/s , then the height of the building is:

(Take $g = 10\text{ m/s}^2$)

 - 140 m
 - 80 m
 - 100 m
 - 120 m
- A concave lens of focal length, 25 cm is sandwiched between two convex lenses, each of focal length, 40 cm . The power in dioptre of the combined lens would be:
 - 9
 - 1
 - 0.01
 - 55
- A network of resistors is connected across a 10 V battery with internal resistance of $1\ \Omega$ as shown in the circuit diagram. The equivalent resistance of the circuit is:

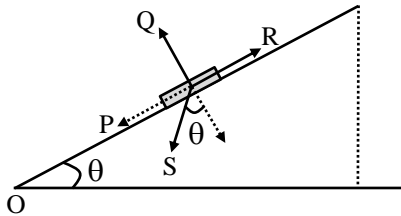


- $\frac{14}{3}\ \Omega$
 - $\frac{12}{7}\ \Omega$
 - $\frac{14}{7}\ \Omega$
 - $\frac{17}{3}\ \Omega$
- The correct statement about the variation of viscosity of fluid with increase in temperature:
 - viscosity of both liquids and gases increases
 - viscosity of liquids increases
 - viscosity of liquids decreases
 - viscosity of gases decreases
 - Let L_1 and L_2 be the orbital angular momentum of an electron in the first and second excited states of hydrogen atom, respectively. According to the Bohr's model, the ratio $L_1 : L_2$ is:
 - $2 : 1$
 - $3 : 2$
 - $2 : 3$
 - $1 : 2$

12. During simple harmonic motion of a body, the energy at the extreme positions is:

(1) is always zero
 (2) purely kinetic
 (3) purely potential
 (4) both kinetic and potential

13.



When a body of mass 'm' just begins to slide as shown, match list-I with List-II:

List-I	List-II
(a) Normal reaction	(i) P
(b) Frictional force (f_s)	(ii) Q
(c) Weight (mg)	(iii) R
(d) $mg\sin\theta$	(iv) S

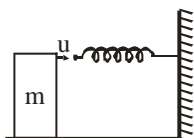
Choose the correct answer from the options given below:

- (1) (a)-(iv), (b)-(ii), (c)-(iii), (d)-(i)
 (2) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)
 (3) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)
 (4) (a)-(ii), (b)-(i), (c)-(iii), (d)-(iv)

14. Twelve point charges each of charge q coulomb are placed at the circumference of a circle of radius r with equal angular spacing. If one of the charges is removed, the net electric field (in N/C) at the centre of the circle is : (ϵ_0 – permittivity of free space)

- (1) $\frac{13q}{4\pi\epsilon_0 r^2}$ (2) zero
 (3) $\frac{q}{4\pi\epsilon_0 r^2}$ (4) $\frac{12q}{4\pi\epsilon_0 r^2}$

15. A block of mass m is moving with initial velocity u towards a stationary spring of stiffness constant k attached to the wall as shown in the figure. Maximum compression of the spring is:
 (The friction between the block and the surface is negligible)



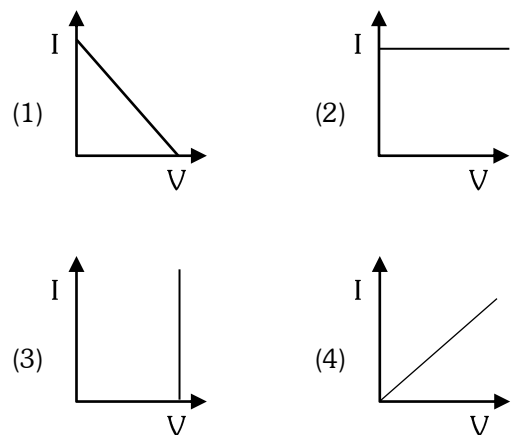
- (1) $4u\sqrt{\frac{m}{k}}$ (2) $2u\sqrt{\frac{m}{k}}$
 (3) $\frac{1}{2}u\sqrt{\frac{k}{m}}$ (4) $u\sqrt{\frac{m}{k}}$

- 16.

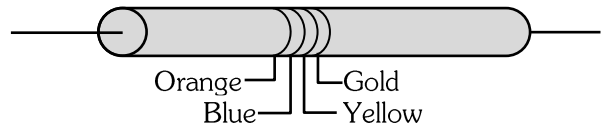
The output of the logic circuit shown is equivalent to a/an:

- (1) NOR gate (2) AND gate
 (3) NAND gate (4) OR gate

17. The plot of current I flowing through a conductor versus the applied voltage V across the ends of a conductor is:



18. The value of resistance for the colour code of the given resistor is:



- (1) $(470 \pm 47) \text{ k}\Omega$ (2) $(360 \pm 36) \text{ k}\Omega$
 (3) $(360 \pm 18) \text{ k}\Omega$ (4) $(36 \pm 36) \text{ k}\Omega$

19. An inductor coil of self inductance 10 H carries a current of 1 A . The magnetic field energy stored in the coil is:

- (1) 2.5 J (2) 20 J
 (3) 5 J (4) 10 J

20. The dimensions of mutual inductance (M) are:

- (1) $[\text{MLT}^{-2}\text{A}^2]$ (2) $[\text{M}^2\text{L}^2\text{T}^{-2}\text{A}^2]$
 (3) $[\text{ML}^2\text{T}^{-2}\text{A}^{-2}]$ (4) $[\text{M}^2\text{LT}^{-2}\text{A}^{-2}]$

21. A strong magnetic field is applied along the direction of velocity of an electron. The electron would move along:

- (1) the original path (2) a helical path
 (3) a circular path (4) a parabolic path

22. In a photoelectric experiment, blue light is capable of ejecting a photoelectron from a specific metal while green light is not able to eject a photoelectron. Ejection of photoelectrons is also possible using light of the colour:

(1) Red (2) Violet
(3) Orange (4) Yellow

23. When the circular scale of a screw gauge completes 2 rotations, it covers 1 mm over the pitch scale. The total number of the circular scale divisions is 50. The least count of the screw gauge in metre is:

(1) 10^{-5} (2) 10^{-2}
(3) 10^{-3} (4) 10^{-4}

24. A beam of light is incident vertically on a glass slab of thickness 1 cm, and refractive index 1.5. A fraction 'A' is reflected from the front surface while another fraction 'B' enters the slab and emerges after reflection from the back surface. Time delay between them is:

(1) 5×10^{-10} s (2) 10^{-11} s
(3) 5×10^{-11} s (4) 10^{-10} s

25. Given below are two statements: One is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A): A standing bus suddenly accelerates. If there were no friction between the feet of a passenger and the floor of the bus, the passenger would move back.

Reason (R): In the absence of friction, the floor of the bus would slip forward under the feet of the passenger.

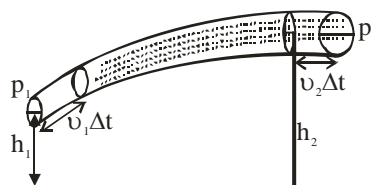
In the light of the above statements, choose the most appropriate answer from the options given below:

(1) (A) is false but (R) is true
(2) Both (A) and (R) are true and (R) is the correct explanation of (A)
(3) Both (A) and (R) are true and (R) is not the correct explanation of (A)
(4) (A) is true but (R) is false

26. A gas undergoes an isothermal process. The specific heat capacity of the gas in the process is:

(1) 0.5 (2) zero
(3) 1 (4) infinity

27. A fluid of density ρ is flowing in a pipe of varying cross-sectional area as shown in the figure. The Bernoulli's equation for the motion becomes:



(1) $p + \frac{1}{2} \rho v^2 = \text{constant}$
(2) $\frac{1}{2} \rho v^2 + \rho gh = \text{constant}$
(3) $p + \rho gh = \text{constant}$
(4) $p + \frac{1}{2} \rho v^2 + \rho gh = \text{constant}$

28. At some instant, the number of radioactive atoms in a sample is N_0 and after time 't' the number decreases to N. It is found that the graphical representation 'ln N' versus 't' along the y and x axes respectively is a straight line. Then the slope of this line is:

(1) $-\lambda$ (2) λ^{-1}
(3) $-\lambda^{-1}$ (4) λ

29. A particle of mass 4 M kg at rest splits into two particles of mass M and 3 M. The ratio of the kinetic energies of mass M and 3M would be:

(1) 1 : 4 (2) 1 : 1
(3) 1 : 3 (4) 3 : 1

30. A hollow metal sphere of radius R is given '+Q' charge to its outer surface. The electric potential at a distance $\frac{R}{3}$ from the centre of the sphere will be:

(1) $\frac{3}{4\pi\epsilon_0} \frac{Q}{R}$
(2) $\frac{1}{4\pi\epsilon_0} \frac{Q}{3R}$
(3) $\frac{1}{4\pi\epsilon_0} \frac{Q}{R}$
(4) $\frac{1}{4\pi\epsilon_0} \frac{Q}{9R}$

31. Rain is falling vertically downward with a speed of 35 m/s. Wind starts blowing after some time with a speed of 12 m/s in East to West direction. The direction in which a boy standing at the place should hold his umbrella is:

(1) $\tan^{-1}\left(\frac{12}{37}\right)$ w.r.t. wind

(2) $\tan^{-1}\left(\frac{12}{35}\right)$ w.r.t. rain

(3) $\tan^{-1}\left(\frac{12}{35}\right)$ w.r.t. wind

(4) $\tan^{-1}\left(\frac{12}{37}\right)$ w.r.t. rain

32. The ratio of the moments of inertia of two spheres about their diameter and having same mass and their radii in the ratio 1 : 2 is:

(1) 4 : 1 (2) 1 : 2

(3) 1 : 4 (4) 2 : 1

33. A string is wrapped along the rim of a wheel of moment of inertia 0.10 kg-m^2 and radius 10 cm. If the string is now pulled by a force 10 N, then the wheel starts to rotate about its axis from rest. The angular velocity of the wheel after 2 seconds is:

(1) 80 rad/s (2) 10 rad/s

(3) 20 rad/s (4) 40 rad/s

34. Assuming the earth to be a sphere of uniform density, its acceleration due to gravity acting on a body:

(1) increases with increasing depth

(2) is independent of the mass of the earth

(3) is independent of the mass of the body

(4) increases with increasing altitude

35. If λ_X , λ_I , λ_M and λ_γ are the wavelengths of X-rays, infrared rays, microwaves and γ rays respectively, then:

(1) $\lambda_M < \lambda_I < \lambda_X < \lambda_\gamma$

(2) $\lambda_X < \lambda_\gamma < \lambda_M < \lambda_I$

(3) $\lambda_X < \lambda_I < \lambda_\gamma < \lambda_M$

(4) $\lambda_\gamma < \lambda_X < \lambda_I < \lambda_M$

Section-B (Physics)

36. The fraction of the original number of radioactive atoms that disintegrates (decays) during the average life time of a radioactive substance will be :

(1) $\frac{1}{1+e}$

(2) $\frac{e-1}{e+1}$

(3) $\frac{e-1}{e}$

(4) $\frac{1}{e}$

37. Three capacitors, each of capacitance $0.3 \mu\text{F}$ are connected in parallel. This combination is connected with another capacitor of capacitance $0.1 \mu\text{F}$ in series. Then the equivalent capacitance of the combination is:

(1) $0.09 \mu\text{F}$

(2) $0.1 \mu\text{F}$

(3) $0.01 \mu\text{F}$

(4) $0.9 \mu\text{F}$

38. Given below are two statements:

Statement-I: The magnetic field of circular current loop at very far away point on the axial line varies with distance as like that of a magnetic dipole.

Statement-II: The magnetic field due to magnetic dipole varies inversely with the square of the distance from the centre on the axial line.

In light of above statements, choose the most appropriate answer from the options given below:

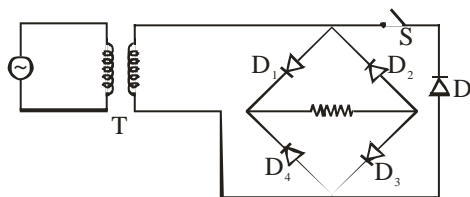
(1) **Statement-I** is incorrect and **Statement-II** is correct.

(2) Both **Statement-I** and **Statement-II** are correct.

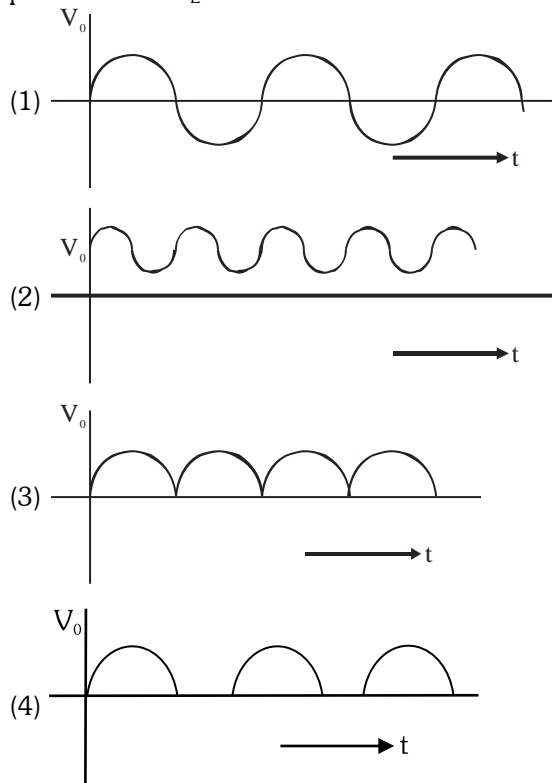
(3) Both **Statement-I** and **Statement-II** are incorrect.

(4) **Statement-I** is correct and **Statement-II** is incorrect.

39.



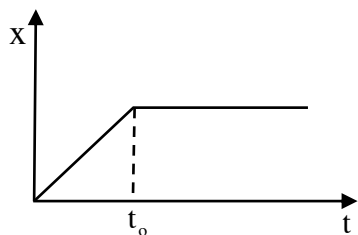
The circuit represents a full wave bridge rectifier when switch S is open. The output voltage (V_0) pattern across R_L when S is closed is:



40. When a particle with charge $+q$ is thrown with an initial velocity v towards another stationary charge $+Q$, it is respelled back after reaching the nearest distance r from $+Q$. The closest distance that it can reach if it is thrown with initial velocity $2v$, is:

- (1) $\frac{r}{2}$ (2) $\frac{r}{16}$ (3) $\frac{r}{8}$ (4) $\frac{r}{4}$

41. The figure given below shows the displacement and time, (x - t) graph of particle moving along a straight line:



The correct statement, about the motion of the particle is:

- (1) The particle is accelerated throughout its motion.
(2) The particle is accelerated continuously for time t_0 then moves with constant velocity.
(3) The particle is at rest.
(4) The particle moves at constant velocity up to a time t_0 and then stops.

42. The temperature at which the rms speed of atoms in neon gas is equal to the rms speed of hydrogen molecules at 15°C is:

(Atomic mass of neon = 20.2 u , molecular mass of $\text{H}_2 = 2 \text{ u}$)

- (1) 2.9 K (2) $0.15 \times 10^3 \text{ K}$
(3) $0.29 \times 10^3 \text{ K}$ (4) $2.9 \times 10^3 \text{ K}$

43. Air is pushed carefully into a soap bubble of radius r to double its radius. If the surface tension of the soap solution is T , then work done in the process is:

- (1) $24 \pi r^2 T$ (2) $4 \pi r^2 T$
(3) $8 \pi r^2 T$ (4) $12 \pi r^2 T$

44. Given below are two statements: One is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A): Gauss's law for magnetism states that the net magnetic flux through any closed surface is zero.

Reason (R): The magnetic monopoles do not exist. North and South poles occur in pairs, allowing vanishing net magnetic flux through the surface.

In the light of the above statement, choose the most appropriate answer from the options given below:

- (1) **(A)** is false but **(R)** is true
(2) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**
(3) Both **(A)** and **(R)** are true and **(R)** is not the correct explanation of **(A)**
(4) **(A)** is true but **(R)** is false

45. A monochromatic light of frequency 500 THz is incident on the slits of a Young's double slit experiment. If the distance between the slits is 0.2 mm and the screen is placed at a distance 1 m from the slits, the width of 10 fringes will be:

$$[\text{THz} = 10^{12} \text{ Hz}]$$

- (1) 15 mm
 - (2) 30 mm
 - (3) 3 mm
 - (4) 1.5 mm
46. An a.c. source given by $V = V_m \sin \omega t$ is connected to a pure inductor L in a circuit and I_m is the peak value of the ac current. The instantaneous power supplied to the inductor is:

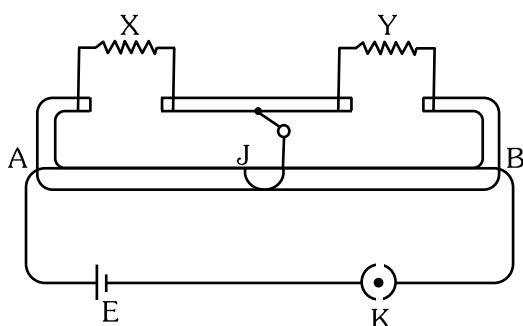
$$(1) -\frac{V_m I_m}{2} \sin(2\omega t)$$

$$(2) V_m I_m \sin^2(\omega t)$$

$$(3) -V_m I_m \sin^2(\omega t)$$

$$(4) \frac{V_m I_m}{2} \sin(2\omega t)$$

47. In a metre bridge experiment, the null point is at a distance of 30 cm from A. If a resistance of 16Ω is connected in parallel with resistance Y , the null point occurs at 50 cm from A. The value of the resistance Y is:



$$(1) \frac{40}{3} \Omega$$

$$(2) \frac{64}{3} \Omega$$

$$(3) \frac{48}{3} \Omega$$

$$(4) \frac{112}{3} \Omega$$

48. Two planets are in a circular orbit of radius R and $4R$ about a star. At a specific time, the two planets and the star are in a straight line. If the period of the closest planet is T , then the star and planets will again be in a straight line after a minimum time:

$$(1) (4)^{\frac{1}{3}} T$$

$$(2) 2 T$$

$$(3) 8 T$$

$$(4) (4)^2 T$$

49. A string of length l is fixed at both ends and is vibrating in second harmonic. The amplitude at antinode is 2 mm. The amplitude of a particle at a distance $\frac{l}{8}$ from the fixed end is:

$$(1) 4 \text{ mm}$$

$$(2) \sqrt{2} \text{ mm}$$

$$(3) 2\sqrt{3} \text{ mm}$$

$$(4) 2\sqrt{2} \text{ mm}$$

50. The determination of the value of acceleration due to gravity (g) by simple pendulum method employs the formula,

$$g = 4\pi^2 \frac{L}{T^2}$$

The expression for the relative error in the value of ' g ' is:

$$(1) \frac{\Delta g}{g} = 4\pi^2 \left[\frac{\Delta L}{L} - 2 \frac{\Delta T}{T} \right]$$

$$(2) \frac{\Delta g}{g} = 4\pi^2 \left[\frac{\Delta L}{L} + 2 \frac{\Delta T}{T} \right]$$

$$(3) \frac{\Delta g}{g} = \frac{\Delta L}{L} - 2 \frac{\Delta T}{T}$$

$$(4) \frac{\Delta g}{g} = \frac{\Delta L}{L} + 2 \frac{\Delta T}{T}$$

Section-A (Chemistry)

51. Match **List-I** with **List-II** :

List-I (Monomers)	List-II (Polymers)
(a) Caprolactam	(i) Bakelite
(b) Ethylene glycol and Benzene-1,4-dicarboxylic acid	(ii) Nylon 6,6
(c) Hexamethylenediamine and adipic acid	(iii) Nylon-6
(d) Phenol and Formaldehyde	(iv) Terylene

Choose the **correct answer** from the options given below :

- (1) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)
- (2) (a)-(iii), (b)-(iv), (c)-(ii), (d)-(i)
- (3) (a)-(iv), (b)-(ii), (c)-(i), (d)-(iii)
- (4) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)

52. Which of the following is the correct statement ?

- (1) Al^+ is more stable than In^+
- (2) Ga^+ is more stable than Al^+
- (3) Al^+ is more stable than Ga^+
- (4) Ga^+ is more stable than In^+

53. Which one of the following statements is true about the structure of CO_3^{2-} ion ?

- (1) Out of the three C–O bonds, two are longer and one is shorter.
- (2) It has three sigma and three π -bonds.
- (3) All three C–O bonds are equal in length with a bond order in between 1 and 2.
- (4) It can be explained by considering sp^3 hybridization.

54. Which one of the following electrons in the ground state will have least amount of energy?

- (1) An electron in 2p orbital of carbon atom.
- (2) The electron of copper atom present in 4s orbital.
- (3) The outermost electron in sodium atom.
- (4) An electron in hydrogen atom.

55. Which of the following is not correct about postulates of kinetic molecular theory of gases?

- (1) Volume of the gas is due to the large number of molecules of the gas.
- (2) Average kinetic energy of molecules is directly proportional to the absolute temperature of the gas.
- (3) The molecules move randomly with different speeds in different directions.
- (4) Pressure of the gas is due to the collision of molecules against the walls of the container.

56. The work done when 1 mole of a gas expands reversibly and isothermally from pressure of 5 atm to 1 atm at 300 K is

(Given $\log 5 = 0.6989$ and $R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$)

- (1) 150 J
- (2) + 4014.6 J
- (3) –4014.6 J
- (4) zero J

57. LiF is sparingly soluble in water because it has

- (1) small electronegativity.
- (2) high lattice enthalpy.
- (3) low hydration enthalpy.
- (4) partial covalent character.

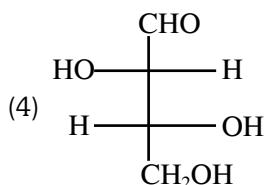
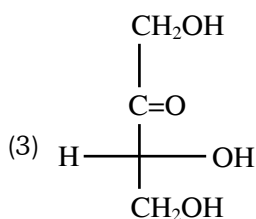
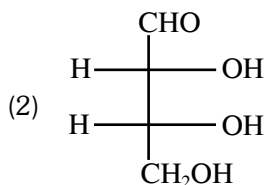
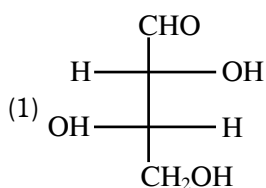
58. What is the **correct** order for boiling points of the following compounds ?

- (1) $\text{BiH}_3 > \text{SbH}_3 > \text{NH}_3 > \text{AsH}_3 > \text{PH}_3$
- (2) $\text{NH}_3 > \text{PH}_3 > \text{AsH}_3 > \text{SbH}_3 > \text{BiH}_3$
- (3) $\text{PH}_3 > \text{NH}_3 > \text{AsH}_3 > \text{SbH}_3 > \text{BiH}_3$
- (4) $\text{AsH}_3 > \text{PH}_3 > \text{NH}_3 > \text{SbH}_3 > \text{BiH}_3$

59. A ferromagnetic substance becomes a permanent magnet when it is placed in a magnetic field because

- (1) domains are not affected by magnetic field.
- (2) domains get randomly oriented.
- (3) all the domains get oriented in the direction of magnetic field.
- (4) all the domains get oriented in the direction opposite to the direction of magnetic field.

60. Which one is not a D-sugar ?



61. Match **List-I** with **List-II** :

List-I	List-II
(Amines)	(pK_b values)
(a) N-methylmethanamine	(i) 9.30
(b) Ammonia	(ii) 9.38
(c) N-methylaniline	(iii) 4.75
(d) Benzenamine	(iv) 3.27

Choose the **correct answer** from the options given below :

- (1) (a)-(iv), (b)-(iii), (c)-(i), (d)-(ii)
 (2) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)
 (3) (a)-(i), (b)-(iv), (c)-(iii), (d)-(ii)
 (4) (a)-(iv), (b)-(ii), (c)-(i), (d)-(iii)

62. The number of bridging carbonyl groups in [Co₂(CO)₈] and [Mn₂(CO)₁₀], respectively are

- (1) 2 and 2
 (2) 2 and 4
 (3) 0 and 2
 (4) 2 and 0

63. Match **List-I** with **List-II** :

List-I	List-II
(a) Element which exhibits +3 oxidation state only	(i) Mn
(b) Element which exhibits more number of oxidation states	(ii) Zn
(c) Element which is a reducing agent in its +2 oxidation state	(iii) Sc
(d) Element which is not considered as a transition element	(iv) Cr

Choose the **correct answer** from the options given below :

- (1) (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)
 (2) (a)-(ii), (b)-(iv), (c)-(iii), (d)-(i)
 (3) (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii)
 (4) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)

64. Given below are two statements :

Statement - I : The product of reaction of phenol with bromine depends on the nature of solvent.

Statement - II : Reaction of phenol with bromine in CHCl₃ gives monosubstituted bromo derivative whereas reaction of phenol with bromine water yields trisubstituted bromo derivative of phenol.

In light of the above statements, choose the most appropriate answer from the options given below:

- (1) **Statement-I** is incorrect and **Statement-II** is correct
 (2) Both **Statement-I** and **Statement-II** are correct
 (3) Both **Statement-I** and **Statement-II** are incorrect
 (4) **Statement-I** is correct and **Statement-II** is incorrect

65. Match List-I with List-II :

List-I (Example of Colloidal Systems)	List-II (Nature of dispersion medium and dispersed phase)
(a) Insecticide spray	(i) Dispersion medium-liquid Dispersed phase - solid
(b) Whipped Cream	(ii) Dispersion medium – gas Dispersed phase – liquid
(c) Paint	(iii) Dispersion medium– liquid Dispersed phase – liquid
(d) Hair Cream	(iv) Dispersion medium– liquid Dispersed phase - gas

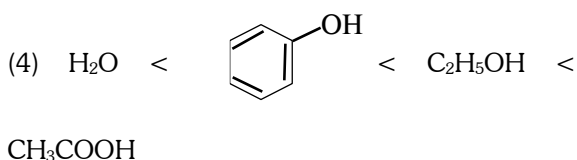
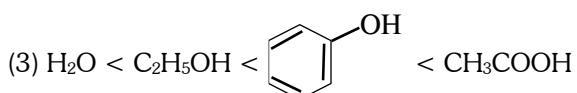
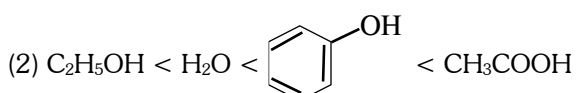
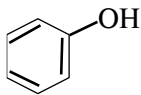
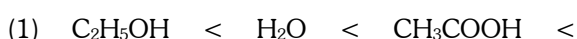
Choose the **correct answer** from the options given below :

- (1) (a)-(iv), (b)-(ii), (c)-(iii), (d)-(i)
- (2) (a)-(ii), (b)-(iv), (c)-(iii), (d)-(i)
- (3) (a)-(iv), (b)-(ii), (c)-(i), (d)-(iii)
- (4) (a)-(ii), (b)-(iv), (c)-(i), (d)-(iii)

66. The solubility product of BaSO_4 in water is 1.5×10^{-9} . The molar solubility of BaSO_4 in 0.1 M solution of $\text{Ba}(\text{NO}_3)_2$ is

- (1) 0.5×10^{-8} M
- (2) 1.5×10^{-8} M
- (3) 1.0×10^{-8} M
- (4) 2.0×10^{-8} M

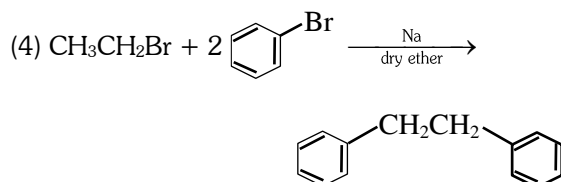
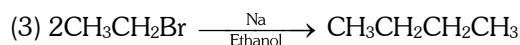
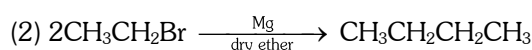
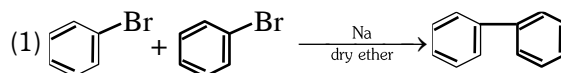
67. The correct order of acid strength of the following molecules is



68. Which one of the following is the **correct** order of decreasing bond enthalpies for the given species ?

- (1) $\text{N}_2 > \text{O}_2 > \text{O}_2^{2-} > \text{O}_2^-$
- (2) $\text{N}_2 > \text{O}_2 > \text{O}_2^- > \text{O}_2^{2-}$
- (3) $\text{O}_2 > \text{N}_2 > \text{O}_2^- > \text{O}_2^{2-}$
- (4) $\text{O}_2^{2-} > \text{O}_2^- > \text{O}_2 > \text{N}_2$

69. The correct reaction among the following is



70. Given below are two statements :

Statement-I : Aldehydes and ketones having at least one α -hydrogen undergo aldol condensation in the presence of dilute alkali as catalyst.

Statement-II : When aldol condensation is carried out between two different aldehydes, it is called cross aldol condensation. Ketones do not give this reaction.

In light of the above statements, choose the most appropriate answer from the options given below:

- (1) **Statement-I** is incorrect and **Statement-II** is correct.
- (2) Both **Statement-I** and **Statement-II** are correct.
- (3) Both **Statement-I** and **Statement-II** are incorrect.
- (4) **Statement-I** is correct and **Statement-II** is incorrect.

71. The **incorrect statement** among the following regarding food preservatives is

- (1) antioxidants used in wine are SO_2 and sulphites.
- (2) antioxidants help in preserving the food longer.
- (3) antioxidants react with oxygen with a slower rate than food.
- (4) sorbic acid and propanoic acid are good food preservatives.

72. One mole of sugar is dissolved in three moles of water at 298 K. The relative lowering of vapour pressure is

- (1) 0.20
- (2) 0.50
- (3) 0.33
- (4) 0.25



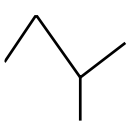

73. Match **List-I** with **List-II** :

List-I Elements	List-II Atomic radii (pm)
(a) O	(i) 88
(b) C	(ii) 74
(c) B	(iii) 66
(d) N	(iv) 77

Choose the **correct answer** from the options given below :

- (1) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)
- (2) (a)-(i), (b)-(iv), (c)-(iii), (d)-(ii)
- (3) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)
- (4) (a)-(ii), (b)-(i), (c)-(iv), (d)-(iii)

74. Match **List-I** with **List-II** :

List-I (Compound)	List-II (Boiling Point in K)
(a) 	(i) 300.9
(b) 	(ii) 282.5
(c) 	(iii) 309.1
(d) 	(iv) 341.9

Choose the **correct answer** from the options given below :

- (1) (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii)
- (2) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)
- (3) (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)
- (4) (a)-(i), (b)-(iv), (c)-(iii), (d)-(ii)

75. Alkali metals, though white, impart a characteristic colour to the flame because of

- (1) oxidation of metal in the presence of flame.
- (2) excitation of valence electrons.
- (3) gain of electrons,
- (4) excitation and coming back of valence electrons to the original level.

76. Identify the set from the following sets in which all species can exhibit disproportionation reactions.

- (1) Cl_2 , ClO_2^- , ClO_3^- , S_8
- (2) ClO_4^- , ClO^- , ClO_2^- , F_2
- (3) ClO_3^- , ClO_4^- , H_2O_2 , ClO^-
- (4) ClO_2^- , ClO_3^- , ClO_4^- , Cl_2

77. For the reaction, $2\text{A} \rightarrow \text{B}$. rate = $k[\text{A}]^2$.

If concentration of reactant is doubled, then the

- (a) rate of reaction will be doubled.
- (b) rate constant will remain unchanged, however rate of reaction is directly proportional to the rate constant.
- (c) rate constant will change since rate of reaction and rate constant are directly proportional to each other.
- (d) rate of reaction will increase by four times.

Identify the set of correct statements :

Choose the **correct answer** from the options given below :

- (1) (a), (b) only
- (2) (b), (d) only
- (3) (c), (d) only
- (4) (a), (c) only

78. Match **List-I** with **List-II** :

List-I	List-II
(a) Separation of aniline-water mixture	(i) Fractional distillation
(b) Separation of aniline-chloroform mixture	(ii) Distillation under reduced pressure
(c) Separation of glycerol from spent-lye	(iii) Distillation
(d) Separation of different fractions of crude oil	(iv) Steam distillation

Choose the **correct answer** from the options given below :

- (1) (a)-(iv), (b)-(i), (c)-(iii), (d)-(ii)
- (2) (a)-(iv), (b)-(ii), (c)-(iii), (d)-(i)
- (3) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)
- (4) (a)-(i), (b)-(iii), (c)-(ii), (d)-(iv)

79. Match **List-I** with **List-II** :

List-I	List-II
(a) 4.48 litres of O ₂ at STP	(i) 0.2 moles
(b) 12.022×10^{22} molecules of H ₂ O	(ii) 12.044×10^{23} molecules
(c) 96 g of O ₂	(iii) 6.4 g
(d) 88 g of CO ₂	(iv) 67.2 litres at STP

(Given – Molar volume of a gas at STP = 22.4 L)

Choose the **correct answer** from the options given below :

- (1) (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii)
- (2) (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)
- (3) (a)-(iii), (b)-(i), (c)-(ii), (d)-(iv)
- (4) (a)-(i), (b)-(iii), (c)-(iv), (d)-(ii)

80. Match **List-I** with **List-II** :

List-I (Commercial name)	List-II (Chemical name)
(a) Calgon	(i) Sodium aluminium silicate (hydrated)
(b) Permutit	(ii) Sodium carbonate
(c) Soap	(iii) Sodium hexameta-phosphate
(d) Washing soda	(iv) Sodium stearate

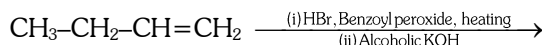
Choose the **correct answer** from the options given below :

- (1) (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii)
- (2) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)
- (3) (a)-(iv), (b)-(iii), (c)-(i), (d)-(ii)
- (4) (a)-(i), (b)-(iv), (c)-(ii), (d)-(iii)

81. Chlorine shows the bleaching action in the presence of moisture due to the formation of

- (1) HOClO
- (2) H₂O₂
- (3) O
- (4) HOCl

82. The product formed in the following reaction sequence is



- (1) CH₃–CH=CH–CH₃
- (2) CH₃–CH₂–CH=CH₂
- (3) CH₃–CH₂–CH₂–CH₂–OH
- (4) CH₃–CH₂–CH(OH)–CH₃

83. The three cells with their $E^\circ_{\text{(cell)}}$ values are given below :

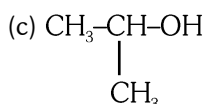
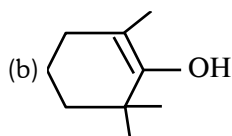
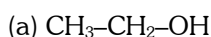
Cells	$E^\circ_{\text{(cell)}} / \text{V}$
(a) Fe Fe ²⁺ Fe ³⁺ Fe	0.404
(b) Fe Fe ²⁺ Fe ³⁺ , Fe ²⁺ Pt	1.211
(c) Fe Fe ³⁺ Fe ³⁺ , Fe ²⁺ Pt	0.807

The standard Gibbs free energy change values for three cells are, respectively

(F represents charge on 1 mole of electrons)

- (1) +2.424 F, +2.422 F, +2.421 F
- (2) –0.808 F, –2.422 F, –2.421 F
- (3) –2.424 F, –2.422 F, –2.421 F
- (4) –1.212 F, –1.211 F, –0.807 F

84. The increasing order of reactivity of the following compounds towards acid catalysed dehydration is

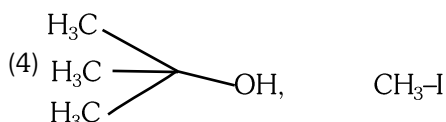
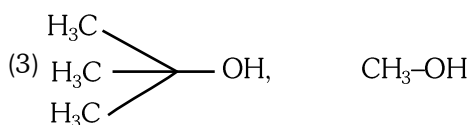
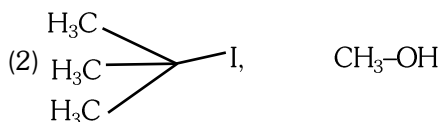
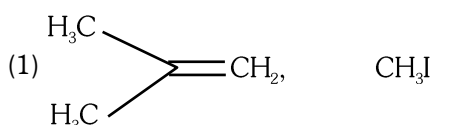
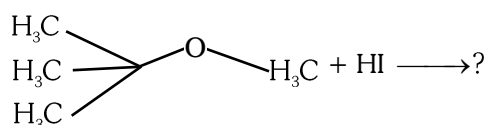


Choose the **correct answer** from the options given below :

- (1) (b) < (a) < (c) < (d)
 (2) (a) < (c) < (d) < (b)
 (3) (c) < (a) < (b) < (d)
 (4) (b) < (c) < (a) < (d)
85. The chain length of silicones can be controlled by adding
- (1) SiCl_4 (2) $(\text{CH}_3)_2\text{SiCl}_2$
 (3) $(\text{CH}_3)_3\text{SiCl}$ (4) CH_3SiCl_3

Section-B (Chemistry)

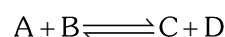
86. The major products formed in the following reaction are



87. A student collected samples from two water bodies A and B in a metro city. The biochemical oxygen demand for 'A' is 3 ppm while for B is found to be 18 ppm. Which one of the following is **true**?

- (1) Both A and B are polluted.
 (2) A is clean but B is polluted.
 (3) A is polluted but B is clean.
 (4) Both A and B are clean.

88. Consider the following reaction taking place in 1 L capacity container at 300 K.



If one mole each of A and B are present initially and at equilibrium 0.7 mol of C is formed, then equilibrium constant (K_c) for the reaction is

- (1) 1.2 (2) 6.2
 (3) 5.4 (4) 9.7

89. Λ_m° for NaCl, HCl and CH_3COONa are 126.4, 425.9 and $91.05 \text{ S cm}^2 \text{ mol}^{-1}$ respectively. If conductivity of $0.001028 \text{ mol L}^{-1}$ acetic acid solution is $4.95 \times 10^{-5} \text{ S cm}^{-1}$, find the degree of dissociation of the acetic acid solution

- (1) 1.00 (2) 0.1233
 (3) 1.233 (4) 0.01233

90. The compound obtained by addition of water to an alkyne having more than two carbons, in presence of HgSO_4 and dilute H_2SO_4 at 333 K is

- (1) an aldehyde (2) an alcohol
 (3) a ketone (4) a vicinal diol

91. Given below are two statements :

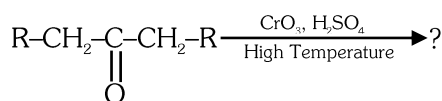
Statement-I : The Ellingham diagram provides an idea about the feasibility of a reaction.

Statement-II : The Ellingham explains the rate of the reduction reactions.

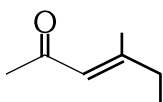
In light of above statements, choose the most **appropriate** answer from the options given below

- (1) **Statement-I** is incorrect and **Statement-II** is correct.
 (2) Both **Statement-I** and **Statement-II** are correct.
 (3) Both **Statement-I** and **Statement-II** are incorrect.
 (4) **Statement-I** is correct and **Statement-II** is incorrect.

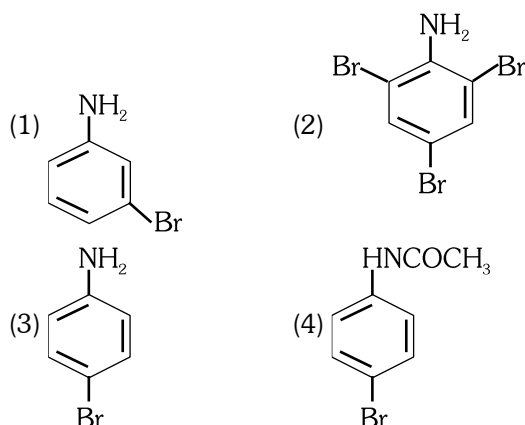
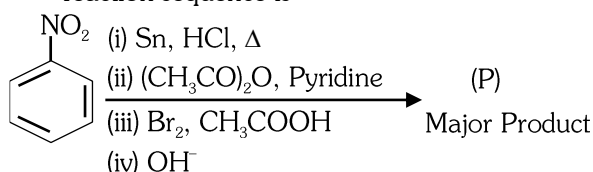
92. The product(s) formed from the following reaction is/are



- (1) RCH_2COOH only
 (2) $\text{R}-\text{CH}_2-\underset{\text{COOH}}{\text{CH}}-\text{CH}_2-\text{R}$ only
 (3) RCOOH and RCH_2COOH
 (4) RCOOH only
93. Identify the pair of Lanthanoides with one strong oxidant and one strong reductant.
 (1) Yb(II), Eu(II) (2) Eu(IV), Lu(III)
 (3) Ce(IV), Eu(II) (4) Ce(IV), Tb(IV)
94. A monochromatic infrared range finder of power 1 mW emits photons with wavelength 1000 nm in 0.1 second. The number of photons emitted in 0.1 second is
 (Given : $h = 6.626 \times 10^{-34}$ Js, $c = 3 \times 10^8$ ms⁻¹, Avogadro number = 6.022×10^{23})
 (1) 5×10^{14} (2) 30×10^{34}
 (3) 5×10^{11} (4) 30×10^{37}
95. The correct IUPAC name of the following compound is :-

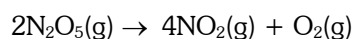


- (1) 4-methylhex-3-en-2-one
 (2) 4-ethylpent-3-en-2-one
 (3) 3-methylhex-3-en-4-one
 (4) 2-ethylhex-3-en-4-one
96. At 300 K, 250 mL of gas A at 1 bar pressure is mixed with 500 mL of gas B at 2 bar pressure in a 1.0 L flask. Gas A does not react with gas B. The final pressure of the mixture is :
 (1) 2.15 bar (2) 2.50 bar
 (3) 1.25 bar (4) 1.00 bar
97. The major product (P) formed in the following reaction sequence is



98. Which one of the following is the correct order of spin-only magnetic moment for the given complexes?
 (1) $[\text{Fe}(\text{CN})_6]^{3-} > [\text{Co}(\text{H}_2\text{O})_6]^{2+} > [\text{MnCl}_6]^{3-}$
 (2) $[\text{MnCl}_6]^{3-} > [\text{Fe}(\text{CN})_6]^{3-} > [\text{Co}(\text{H}_2\text{O})_6]^{2+}$
 (3) $[\text{MnCl}_6]^{3-} > [\text{Co}(\text{H}_2\text{O})_6]^{2+} > [\text{Fe}(\text{CN})_6]^{3-}$
 (4) $[\text{Co}(\text{H}_2\text{O})_6]^{2+} > [\text{MnCl}_6]^{3-} > [\text{Fe}(\text{CN})_6]^{3-}$
99. Which statement among the following is not correct?
 (1) Ferrimagnetism arises due to the alignment of magnetic moments of the domains in the substance in parallel and anti-parallel directions in unequal numbers.
 (2) Replacing some silicon atoms by boron atoms in crystal of silicon produces p-type semiconductor.
 (3) Replacing some germanium atoms by phosphorus atoms in crystal of germanium produces n-type semiconductor.
 (4) When conduction band and valence band overlap, a semiconductor is obtained.

100. The plot of $\ln k$ vs $\frac{1}{T}$ for the following reaction



gives a straight line with the slope of line equal to -1.0×10^4 K. Activation energy for the reaction in J mol^{-1} is

(Given $R = 8.3 \text{ J K}^{-1} \text{ mol}^{-1}$)

- (1) 4.0×10^{-2} (2) 8.3×10^{-4}
 (3) 8.3×10^4 (4) 4.0×10^2

Section-A (Biology : Botany)

- 101.** Which one of the following structures is haploid in its ploidy level?
- (1) Microspore Mother Cell
 - (2) Protonemal cell of a moss
 - (3) Primary endosperm nucleus in dicot
 - (4) Primary Endospore Nucleus
- 102.** Select the **correct** statement related to the activity of cork cambium.
- (1) The cork differentiated from cork cambium, is impervious to water due to deposition of tannins and resins.
 - (2) Cuts the cells only on the outer side.
 - (3) Cuts the cells on inner as well as outer side.
 - (4) The outer cells differentiate into phelloderm.
- 103.** Which one of the following process is responsible for the release of N_2 in the atmosphere?
- (1) Ammonification
 - (2) Denitrification
 - (3) Biological nitrogen fixation
 - (4) Industrial Nitrogen fixation
- 104.** DNA replication is semi-conservative in nature was experimentally proved in eukaryotes by :
- (1) Macleod and McCarty
 - (2) Meselson and Stahl
 - (3) Talyor and his colleagues
 - (4) Hershey and Chase
- 105.** High dose of UV-B causes inflammation of cornea and is called as :
- (1) Colour-blindness
 - (2) Evening-blindness
 - (3) Snow-blindness
 - (4) UV-blindness
- 106.** Match **List - I** with **List - II**
- | List - I | List - II |
|---------------------|--|
| (a) ETS complex-I | (i) Cyt bc_1 |
| (b) ETS complex-II | (ii) Cyt a, a_3 and 2 copper centres |
| (c) ETS complex-III | (iii) NADH dehydrogenase |
| (d) ETS complex-IV | (iv) Ubiquinone and FADH dehydrogenase |

Choose the **correct answer** from the options given below:

- (1) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)
 - (2) (a)-(iii), (b)-(ii), (c)-(i), (d)-(iv)
 - (3) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)
 - (4) (a)-(ii), (b)-(i), (c)-(iv), (d)-(iii)
- 107.** The process of individuals of the same species that have come into the habitat from elsewhere during the time period under consideration is referred as :
- (1) Emigration
 - (2) Competition
 - (3) Immigration
 - (4) Association
- 108.** Which of the following come under the "Evil Quartet"?
- (a) Habitat loss and fragmentation
 - (b) Over-exploitation
 - (c) Alien species invasion
 - (d) Mortality
 - (e) Competition
- Choose the **correct** answer from the options given below :
- (1) (b), (c) and (d)
 - (2) (a), (b) and (c)
 - (3) (a), (b) and (d)
 - (4) (a), (c) and (d)
- 109.** Given below are two statements :
- Statement - I** : Cellulose is a polymeric polysaccharide.
- Statement - II** : The building blocks of cellulose are glucose molecules.
- In the light of the above statements, choose the **correct** answer from the options given below :
- (1) **Statement - I** is incorrect but **Statement - II** is correct
 - (2) Both **Statement - I** and **Statement - II** are correct
 - (3) Both **Statement - I** and **Statement - II** are incorrect
 - (4) **Statement - I** is correct but **Statement - II** is incorrect

- 110.** The living differentiated cells, that lost the capacity to divide anymore, can regain the capacity of division under certain conditions.

This phenomenon is termed as :

- (1) Maturation (2) Differentiation
(3) Dedifferentiation (4) Redifferentiation

111. Match List - I with List - II

List-I

(a) Haemophilia

(b) Down's
recessive
Syndrome

(c) Phenylketonuria

(d) Klinefelter's
Syndrome

List-II

(i) Inborn error of
metabolism which
lacks an enzyme
that converts
phenylalanine
into tyrosine.

(ii) Sex-linked
disorder, defect in
blood coagulation.

(iii) Presence of
additional copy of
X-chromosome
(44+XXY)

(iv) Additional copy of
chromosome
number 21

Choose the **correct answer** from the options given below:

- (1) (a)-(iv), (b)-(ii), (c)-(i), (d)-(iii)
(2) (a)-(ii), (b)-(iii), (c)-(i), (d)-(iv)
(3) (a)-(ii), (b)-(i), (c)-(iii), (d)-(iv)
(4) (a)-(ii), (b)-(iv), (c)-(i), (d)-(iii)

- 112.** Identify the cytochrome which acts as a mobile carrier for the transfer of electrons between complex III and IV?

- (1) Cytochrome a_3
(2) Cytochrome b_{c1}
(3) Cytochrome c
(4) Cytochrome a

- 113.** Which one of the following is not a criterion of genetic material?

- (1) Should be able to express itself in the form of Mendelian character.
(2) Should be able to generate its replica.
(3) Should be stable chemically and structurally.
(4) Should not provide the scope for changes for evolution.

- 114.** Identify the **correct** statements related to the androecium in the flower.

- (a) The sterile stamens are called staminodes.
(b) When stamens are attached to petals they are called epipetalous.
(c) Monadelphly is seen in China-rose.
(d) Polyadelphly is seen in Pea.
(e) Variation in the length of anther filaments is seen in Mustard.

Choose the **correct** answer from the options given below :

- (1) (a), (b), (c) and (e) only
(2) (a), (b) and (c) only
(3) (b), (c) and (d) only
(4) (a), (c), (d) and (e) only

- 115.** Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) : The growth of multicellular organism is due to mitosis.

Reason (R) : Mitosis is also called as equational division and it offers genetic stability.

In the light of the above statements, choose the **correct** answer from the options given below :

- (1) **(A)** is not correct but **(R)** is correct
(2) Both **(A)** and **(R)** are correct and **(R)** is the correct explanation of **(A)**
(3) Both **(A)** and **(R)** are correct but **(R)** is not the correct explanation of **(A)**
(4) **(A)** is correct but **(R)** is not correct

- 116.** Identify the correct set of statements with regard to properties of humus.

- (a) Highly resistant to microbial action.
(b) Dark coloured amorphous substance.
(c) End product of detritus food chain.
(d) Reservoir of nutrients.
(e) Undergoes decomposition very fast.

Choose the correct answer from the options given below :

- (1) (a), (b) and (e) only
(2) (a) and (b) only
(3) (a), (b) and (c) only
(4) (a), (b) and (d) only

- 117.** The products of light reaction in photosynthesis are:
 (1) ATP, NADPH, O_2 and H_2O
 (2) ATP, NADPH and H_2O
 (3) ATP, NADPH and CO_2
 (4) ATP, NADPH and O_2
- 118.** Which one of the following experiments of Frederick Griffith resulted in the discovery of bacterial transformation?
 (1) S-strain (heat killed) + R-strain (live) → injected in to Mice → Mice died
 (2) S-strain → injected in to Mice → Mice died
 (3) R-strain → injected in to Mice → Mice lived
 (4) S-strain (heat killed) → injected in to Mice → Mice lived
- 119.** Which hormone is used to induce immediate stomatal closure in leaves?
 (1) Gibberellin (2) Absciscic Acid
 (3) Auxin (4) Cytokinin
- 120.** Select the **correct** statements with respect to pleiotropism.
 (a) A gene is said to be pleiotropic if it affects more than one trait.
 (b) Phenylketonuria is an example of pleiotropy.
 (c) A condition where one gene has several alleles is referred to as pleiotropism.
 (d) A trait is said to be pleiotropic if several genes control it.
 Choose the **correct** answer from the options given below :
 (1) (a) and (d) only (2) (a), (b) and (c) only
 (3) (b), (c) and (d) only (4) (a) and (b) only
- 121.** Which of the following is the **correct** equation of exponential growth?
 (1) $N_t = N_0 e^{rt}$ (2) $N_t = N_0 e^{rst}$
 (3) $N_t = N_0 e^{rt}$ (4) $N_t = N_0 e^{rnt}$
- 122.** Which of the following plants possesses the placentation of ovules borne on central axis with no septa?
 (1) Pea (2) China-rose
 (3) Primrose (4) Lemon
- 123.** What will be the ploidy of endosperm of a seed produced after crossing tetraploid female plant with tetraploid male plant?
 (1) Hexaploid (2) Diploid
 (3) Triploid (4) Pentaploid
- 124.** Removal of apical dominance by decapitation is utilised for :
 (1) Early senescence
 (2) Hedge making
 (3) Preparing weed-free lawns
 (4) Suppressing the activity of intercalary meristem
- 125.** Which of the following statements about facilitated diffusion is **incorrect**?
 (1) Porins are involved in this process.
 (2) Movement of molecule occurs against the concentration gradient.
 (3) ATP is not required for this process,
 (4) Special proteins of the membrane help in this process.
- 126.** Species Area relationship is described by the following equation.
 $\log S = \log C + Z \log A$
 where Z is :
 (1) Species richness
 (2) Slope of the line
 (3) Y-intercept
 (4) Area
- 127.** Genetically engineered insulin for human is produced from :
 (1) *Pseudomonas putida*
 (2) *Bacillus thuringiensis*
 (3) *Rhizobium meliloti*
 (4) *Escherichia coli*
- 128.** Which of the following physical properties of water is/are responsible for providing water, the high tensile strength and high capillarity during ascent of sap in the plants?
 (1) Cohesion, adhesion and surface tension
 (2) Cohesion only
 (3) Adhesion and cohesion
 (4) Surface tension and cohesion
- 129.** Choose the mismatched pair of leaf character with its example :
 (1) Alternate phyllotaxy - China-rose
 (2) Leaf tendril - Pea
 (3) Opposite phyllotaxy - *Calotropis*
 (4) Palmately compound - *Alstonia*

130. In prophase I of Meiosis, chromosomes start pairing together and synapsis takes place. This process occurs during which of the following stage?

- (1) Diplotene (2) Leptotene
(3) Zygotene (4) Pachytene

131. Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) : Restriction enzyme is a type of endonuclease.

Reason (R) : Restriction enzyme cuts the two strands of DNA at specific positions within the DNA.

In the light of the above statements, choose the **correct** answer from the options given below :

- (1) **(A)** is not correct but **(R)** is correct
(2) Both **(A)** and **(R)** are correct and **(R)** is the correct explanation of **(A)**
(3) Both **(A)** and **(R)** are correct but **(R)** is not the correct explanation of **(A)**
(4) **(A)** is correct but **(R)** is not correct

132. Axillary buds are derived from the activity of:

- (1) Secondary meristem
(2) Apical meristem
(3) Intercalary meristem
(4) Lateral meristem

133. Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) : A father will never pass the gene for haemophilia to his sons.

Reason (R) : Haemophilia is sex-linked (X-linked) recessive trait.

In the light of the above statements, choose the **correct** answer from the options given below :

- (1) **(A)** is not correct but **(R)** is correct
(2) Both **(A)** and **(R)** are correct and **(R)** is the correct explanation of **(A)**
(3) Both **(A)** and **(R)** are correct but **(R)** is **not** the correct explanation of **(A)**
(4) **(A)** is correct but **(R)** is not correct

134. Match **List - I** with **List - II**

List - I

- (a) *Cedrus*
(b) *Adiantum*
(c) *Sphagnum*
(d) *Marchantia*

List - II

- (i) Pteridophyte
(ii) Gymnosperm
(iii) Liverwort
(iv) Moss

Choose the correct answer from the options given below :

- (1) (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii)
(2) (a)-(ii), (b)-(i), (c)-(iv), (d)-(iii)
(3) (a)-(iii), (b)-(iv), (c)-(ii), (d)-(i)
(4) (a)-(ii), (b)-(iii), (c)-(i), (d)-(iv)

135. Phloem sap in the plants mainly consists of:

- (1) fructose and sucrose
(2) glucose and water
(3) sucrose and water
(4) fructose and water

Section-B (Biology : Botany)

136. Which of the following bond is formed as a result of reaction of carboxyl group of one amino acid with amino group of other amino acid with elimination of water?

- (1) Hydrogen Bond
(2) Glycosidic Bond
(3) Peptide Bond
(4) Phosphodiester Bond

137. Which of the following was proved by girdling experiment?

- (1) Symplastic movement of water occurs through interconnected protoplast.
(2) Xylem is responsible for uptake of water.
(3) Phloem is responsible for translocation of food.
(4) Apoplastic movement of water occurs through intercellular spaces.

138. Identify the fungi which do not belong to the group of other fungi among the following.

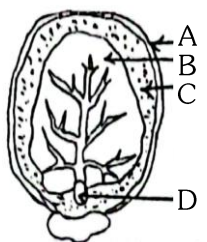
- (1) Puffballs
(2) Mushrooms
(3) Bracket Fungi
(4) Sac-fungi

139. The ratio of carbon dioxide fixation between C_4 plants and C_3 plants is :

- (1) 2 : 3 (2) 1 : 1
(3) 1 : 2 (4) 2 : 1

- 140.** Following crops have been extensively cultivated in CO₂ rich atmosphere for higher yield :
- (1) Carrots and Tomatoes
 - (2) Wheat and Sugar beet
 - (3) Tomatoes and Bell pepper
 - (4) Sugar beet and Cabbage
- 141.** Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.
- Assertion (A) :** In rDNA technology non recombinants transformed bacteria grow on the medium containing ampicillin as well as medium containing tetracycline.
- Reason (R) :** Recombinant plasmids contain the foreign DNA or gene of interest.
- In the light of the above statements, choose the **correct** answer from the options given below :
- (1) **(A)** is not correct but **(R)** is correct
 - (2) Both **(A)** and **(R)** are correct and **(R)** is the correct explanation of **(A)**
 - (3) Both **(A)** and **(R)** are correct, but **(R)** is **not** the correct explanation of **(A)**
 - (4) **(A)** is correct but **(R)** is not correct
- 142.** The thickness of the ozone in a column of air from the ground to the top of the atmosphere is measured in terms of :
- (1) Swedberg units (2) Monomeric units
 - (3) Dobson units (4) Balton units
- 143.** Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.
- Assertion (A) :** Semiconservative replication was experimentally proved by Mathew Meselson and Franklin Stahl (1958).
- Reason (R) :** Meselson and Stahl used radioactive isotope ¹⁵N and equilibrium density gradient centrifugation technique.
- In the light of the above statements, choose the **correct** answer from the options given below :
- (1) **(A)** is not correct but **(R)** is correct
 - (2) Both **(A)** and **(R)** are correct and **(R)** is the correct explanation of **(A)**
 - (3) Both **(A)** and **(R)** are correct but **(R)** is not the correct explanation of **(A)**
 - (4) **(A)** is correct but **(R)** is not correct
- 144.** Which of the following are **not** correct regarding decomposition of wastes?
- (a) Low temperature inhibits decomposition.
 - (b) Warm and moist environment favours the process.
 - (c) The process is anaerobic.
 - (d) It is slower if detritus is rich in proteins and carbohydrates.
 - (e) Detritus is degraded into simpler inorganic substances by fungal and bacterial enzymes.
- Choose the **correct** answer from the options given below :
- (1) (c), (a) and (d) only (2) (c) and (d) only
 - (3) (c), (d) and (e) only (4) (b) and (c) only
- 145.** Which of the following is not a character of collenchyma tissue?
- (1) They occur in layers below epidermis in dicotyledonous plants.
 - (2) They consist of cells with thick corners due to cellulose deposition.
 - (3) They are usually dead and without protoplasts.
 - (4) They provide mechanical support to the growing part of the plant.
- 146.** Assuming that fur colour of an animal is dark, range of colour shade and white. A cross is made between a male (AABBCC) with dark fur colour and a female (aabbcc) with white fur colour. What would be the fur colour of F₁ generation?
- (1) Range of colour shade
 - (2) All dark colour
 - (3) All white colour
 - (4.) All intermediate colour
- 147.** Which of the following pair of micronutrients would help in the light phase of photosynthesis to help in the reaction leading to oxygen evolution?
- (1) Manganese and Molybdenum
 - (2) Molybdenum and Iron
 - (3) Manganese and Chlorine
 - (4) Zinc and Chlorine

148. Which of the following set represents the correct labelling of A, B, C and D with respect to the given diagram?



- (1) A-Seed Coat, B-Scutellum,
C-Endocarp, D-Mesocarp
- (2) A-Seed Coat, B-Scutellum
C-Micropyle, D-Endocarp
- (3) A-Pericarp, B-Coleoptile
C-Endosperm, D-Scutellum
- (4) A-Seed Coat, B-Cotyledon,
C-Endosperm, D-Hypocotyle
149. Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.
- Assertion (A)** : The beginning of diplotene is recognised by the dissolution of the synaptonemal complex and formation of X shaped structures called chiasmata.
- Reason (R)** : In oocytes of some vertebrates, diplotene can last for months or years.
- In the light of the above statements, choose the correct answer from the options given below :
- (1) **(A)** is not correct but **(R)** is correct
- (2) Both **(A)** and **(R)** are correct and **(R)** is the correct explanation of **(A)**
- (3) Both **(A)** and **(R)** are correct but **(R)** not the correct explanation of **(A)**
- (4) **(A)** is correct but **(R)** is not correct
150. The construction of the first recombinant DNA emerged from the possibility of linking a gene encoding antibiotic resistance with a native plasmid of which of the following organism?
- (1) *Bacillus thuringiensis*
- (2) *Salmonella typhimurium*
- (3) *Agrobacterium tumefaciens*
- (4) *Escherichia coli*

Section - A (Biology : Zoology)

151. Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**
- Assertion (A)** : With the help of several ommatidia, a cockroach can perceive several images of an object, ie, mosaic vision.
- Reason (R)** : Mosaic vision gives more sensitivity but less resolution.
- In the light of the above statements, choose the **most appropriate** answer from the option given below :
- (1) **(A)** is not correct but **(R)** is correct
- (2) Both **(A)** and **(R)** are correct and **(R)** is the correct explanation of **(A)**
- (3) Both **(A)** and **(R)** are correct but **(R)** is not the correct explantation of **(A)**
- (4) **(A)** is correct but **(R)** is not correct
152. Inadequate supply of oxygen to heart muscles leads to a symptom of acute chest pain. This disorder of the circulatory system is identified as :
- (1) Cardiac arrest
- (2) Heart failure
- (3) Coronary Heart Disease
- (4) Angina pectoris
153. In *Drosophila*, the genes for color of body and color of eyes are situated on _____.
- (1) autosomes
- (2) Y-chromosome
- (3) X-chromosome
- (4) both the sex chromosomes
154. An intestinal hormone that stimulates the pancreas to release watery secretion that is rich in bicarbonate ions :
- (1) Gastric Inhibitory Peptide
- (2) Enterokin
- (3) Secretin
- (4) Cholecystokinin

- 155.** The hormone releasing IUDs among the following are :
 (a) Multiload 375
 (b) LNG - 20
 (c) Progestasert
 (d) Lippe's loop
 (e) Vaults
 Choose the **most appropriate** answer from the options given below :
 (1) (c) and (e) only
 (2) (a) and (b) only
 (3) (b) and (c) only
 (4) (a) and (d) only
- 156.** Which of the following disorders represents decrease in respiratory surface due to damaged alveolar walls?
 (1) Bronchitis (2) Asthma
 (3) Emphysema (4) Hypocapnia
- 157.** Which of the following is/are vegetative propagule(s)?
 (a) Eyes of Potato
 (b) Zoospore of Chlamydomonas
 (c) Rhizome of Ginger (d) buds in Hydra
 (e) Bulbil of Agave
 Choose the **most appropriate** answer from the options given below :
 (1) (a), (c), (e) only (2) (a), (b), (c), (d) only
 (3) (b), (d) only (4) (e) only
- 158.** In a cell, the separation of DNA strands is brought about by the enzyme DNA helicase, whereas in PCR, the separation of DNA strands is due to :
 (1) Two sets of Primers
 (2) Taq DNA polymerase
 (3) Deoxynucleotides
 (4) High temperature
- 159.** Which of the following types of epithelium lines the walls of blood vessels?
 (1) Squamous epithelium (2) Cuboidal epithelium
 (3) Columnar epithelium (4) Ciliated epithelium
- 160.** Endemism refers to :
 (1) Species evenness
 (2) Species confined to that region
 (3) Species diversity
 (4) Species richness
- 161.** The term 'blue Revolution' is related with :
 (1) Development of water reservoirs
 (2) Honey and its by products
 (3) Fishery industry
 (4) Various crop plants and their by products
- 162.** The oocytes of some vertebrates get arrested for years or months in:
 (1) diplotene (2) Diakinesis
 (3) Metaphase - I (4) Telophase - I
- 163.** Which one of the following is **not** an Assisted Reproductive Technology (ART) used by childless couples to have children?
 (1) IUD (2) IVF
 (3) IUT (4) ZIFT
- 164.** A population with finite resources shows a logistic growth curve where the correct sequence of events will be :
 (1) Acceleration phase → Deceleration → Asymptote
 (2) Acceleration phase → Lag phase → Stationary phase
 (3) Lag phase → Acceleration phase → Deceleration → Asymptote
 (4) Stationary phase → Acceleration phase → Lag phase → Asymptote
- 165.** A low frequency recombination indicates that the genes are :
 (1) Located close to each other
 (2) Not linked
 (3) Present on different chromosomes
 (4) Located far apart from each other
- 166.** Arrange the following male sex accessory ducts in the correct sequence for the transport of sperms from the testes.
 (a) Epididymis (b) Ejaculatory duct
 (c) Vasa efferentia (d) Rete testis
 (e) Vas deferens
 Choose the **most appropriate** answer from the options given below :
 (1) (d), (c), (e), (a), (b)
 (2) (d), (c), (a), (e), (b)
 (3) (d), (e), (a), (c), (b)
 (4) (d), (a), (c), (e), (b)

- 167.** In the regulation of respiration, a chemo-sensitive area adjacent to the rhythm centre in the medulla region of the brain, is highly sensitive to :
- CO_2
 - O_2
 - N_2
 - HCO_3^-
- 168.** Chylomicrons are :
- micro-sized lipid molecules
 - protein coated fat globules
 - spherical aggregates of fatty acids
 - fat coated protein globules
- 169.** Genetic Drift occurs due to :
- Sudden population migration
 - Continuous gene migration
 - Mutation
 - Natural selection
- 170.** Immuno-suppressants are administered to burn-patients or during organ transplantation to suppress :
- Cytokine storm
 - Humoral immunity
 - Cell-mediated immunity
 - Innate immunity
- 171.** Normal sleep-wake cycle in a human body is maintained by the secretion of :
- Thymus gland
 - Pineal gland
 - Pituitary gland
 - Thyroid gland
- 172.** Air bladder is found in :
- Aves
 - Cyclostomata
 - Chondrichthyes
 - Osteichthyes
- 173.** With respect to nucleosome, which of the following statements is **incorrect**?
- Nucleosomes are seen as 'beads on string' under Electron Microscope
 - DNA is wrapped around positively charged histone octamer to form nucleosome.
 - Nucleosome is the repeating unit of chromatin
 - Nucleosome contains 120 bp of DNA helix
- 174.** In a reaction catalyzed by an enzyme, which of the following statements is **correct**?
- Enzymes make transition from substrate to product more difficult.
 - Enzymes increase the activation energy for formation of transition state.
 - Enzyme-substrate complex formed during a reaction lasts for a very long time.
 - Enzyme decrease the activation energy for formation of transition state.
- 175.** Given below are two statements :
- Statements-I :** Membrane-bound organelles of the endomembrane system coordinate cellular functions.
- Statement-II :** Mitochondria and chloroplasts are not considered a part of the endomembrane system.
- In the light of the above statements choose the **most appropriate** answer from the options given below :
- Statement-I** is incorrect but **Statement-II** is correct
 - Both **Statement-I** and **Statement-II** are correct
 - Both **Statement-I** and **Statement-II** are incorrect
 - Statement-I** is correct but **Statement-II** is incorrect
- 176.** One of the strands of double stranded DNA has base composition as follows : 15% A, 15% T, 40% G and 30% C. What will be the percentage of these bases in the complementary strand?
- 15% A, 10% T, 40% G, 15% C
 - 15% A, 15% T, 40% G, 30% C
 - 15% A, 40% T, 15% G, 30% C
 - 15% A, 15% T, 30% G, 40% C

177. Given below are two statements:

Statement-I : Amphibians and reptiles have a 3-chambered heart with two atria and a single ventricle; and oviparous in nature.

Statement-II : Crocodiles possess a 4 chambered heart with two ventricles and two atria; and viviparous in nature.

In the light of the-above statements, choose the **most appropriate** answer from the options given below :

- (1) **Statement-I** is incorrect but **Statement-II** is correct
- (2) Both **Statement-I** and **Statement-II** are correct
- (3) Both **Statement-I** and **Statement-II** are incorrect
- (4) **Statement-I** is correct but **Statement-II** is incorrect

178. Herbarium, Botanical gardens, Museum, Zoological parks and Key are considered as-

- (1) Environmental aids
- (2) Pollution aids
- (3) Taxonomical aids
- (4) Trophic aids

179. Ear wax secreting cells have which type of epithelium?

- (1) Exocrine glandular epithelium
- (2) Compound epithelium
- (3) Endocrine glandular epithelium
- (4) Columnar epithelium

180. Select the **correct** sequence of events occurring during Prophase-I of Meiosis-I.

- (a) Nuclear envelope breakdown
- (b) Synaptonemal complex formation
- (c) Compaction of chromosomes
- (d) Terminalisation of chiasmata
- (e) Crossing over

Choose the **most appropriate** answer from the options given below :

- (1) (c) → (a) → (b) → (d) → (e)
- (2) (b) → (c) → (a) → (d) → (e)
- (3) (c) → (a) → (b) → (e) → (d)
- (4) (c) → (b) → (e) → (d) → (a)

181. Which of the following is a correct statement?

- (1) Z-lines anchor myosin (thick) filament to the ends of the sarcomere.
- (2) Sarcoplasmic reticulum stores acetylcholine.
- (3) Myosin cross bridges contain calcium binding sites.
- (4) Actin and regulatory proteins are located in thin filament.

182. How many Y-chromosomes are present in 2nd polar body in human beings?

- (1) 00
- (2) 23
- (3) 02
- (4) 01

183. Which one of the following hormones reduce the blood pressure?

- (1) Atrial Natriuretic factor
- (2) Aldosterone
- (3) Angiotensin-II
- (4) Antidiuretic hormone

184. Which of the following hormones are secreted in women only during pregnancy?

- (a) Relaxin
- (b) Oxytocin
- (c) hCG
- (d) hPL
- (e) Progesterone

Choose the **most appropriate** answer from the options given below :

- (1) (b) and (e) only
- (2) (b), (c) and (d) only
- (3) (a), (c) and (d) only
- (4) (c), (d) and (e) only

185. Bee-keeping helps to improve the yield of following crops EXCEPT _____.

- (1) Sunflower
- (2) Apple
- (3) Mustard
- (4) Jowar

Section - B (Biology : Zoology)

186. Match **List-I** with **List-II** regarding sensory organs in human.

- | | |
|--------------------|--------------------------|
| (a) Organ of corti | (i) Photo receptors |
| (b) Nasal mucosa | (ii) Gustatory receptors |
| (c) Taste buds | (iii) Auditory receptors |
| (d) Retina | (iv) Olfactory receptors |

Choose the **correct answer** from the options given below :

- (1) (a)-(iii), (b)-(iv), (c)-(ii), (d)-(i)
- (2) (a)-(iv), (b)-(iii), (c)-(i) (d)-(ii)
- (3) (a)-(iii), (b)-(i), (c)-(ii). (d)-(iv)
- (4) (a)-(ii), (b)-(iv), (c)-(iii), (d)-(i)

187. Given below are two statements :

Statement-I : Pyramid of energy is always upright and is the most efficient.

Statement-II : Pyramid of biomass in sea is generally inverted.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

- (1) **Statement-I** is incorrect but **Statement-II** is correct
- (2) Both **Statement-I** and **Statement-II** are correct
- (3) Both **Statement-I** and **Statement-II** are incorrect
- (4) **Statement-I** is correct but **Statement-II** is incorrect

188. Terrestrial adaptations necessitated the production of :

- (1) Lesser toxic nitrogenous wastes like urea and uric acid
- (2) Lesser toxic nitrogenous wastes like ammonia and urea
- (3) Highly toxic nitrogenous wastes like ammonia and urea
- (4) Highly toxic nitrogenous wastes like urea and uric acid

189. Which biological process leads to decrease in fish-eating bird population near a water body containing toxicants from industrial drainage?

- (1) Biochemical oxygen demand
- (2) Accelerated Eutrophication
- (3) Biomagnification
- (4) Algal bloom

190. What would be the proportions of light and hybrid density DNA molecule, respectively if Meselson and Stahl's experiment was continued for 60 minutes ?

- (1) 25%, 75%
- (2) 75%, 25%
- (3) 100%, 0%
- (4) 50%, 50%

191. Identify the properties of a good vector used in rDNA technology.

- (a) It should have origin of replication supporting high copy number.
- (b) It should have preferably more than '2' recognition sites.
- (c) the restriction sites in vector should be in the antibiotic resistant genes.
- (d) It should have suitable marker genes.
- (e) It should be easy to isolate and purify.

Choose the most appropriate answer from the options given below :

- (1) (c), (d) and (e) only
- (2) (a), (b) and (c) only
- (3) (a), (c), (d) and (e) only
- (4) (a), (c) and (e) only

192. Given below two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) : The nematode can not survive in a transgenic host which expresses specific interfering RNA.

Reason (R) : Nematode specific gene introduced in the host produces both sense and antisense complementary RNA which initiate RNA interference in the host cell.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

- (1) **(A)** is not correct but **(R)** is correct
- (2) Both **(A)** and **(R)** are correct and **(R)** is the correct explanation of **(A)**
- (3) Both **(A)** and **(R)** are correct but **(R)** is not the correct explanation of **(A)**
- (4) **(A)** is correct but **(R)** is not correct

193. Match **List - I** with **List - II**

List - I	List - II
(a) Adhering junctions	(i) Establish a barrier that prevents leakage of extracellular fluid across a layer of cells
(b) Tight junctions	(ii) Functions like rivets and fasten cells together into strong sheets
(c) Gap junctions	(iii) Pass information through neuro-transmitters from one cell to another
(d) Synaptic junctions	(iv) Provide cytoplasmic channels from one cell to adjacent cell for communication

Choose the **correct answer** from the options given below:

- (1) (a)-(i), (b)-(iii), (c)-(ii), (d)-(iv)
 (2) (a)-(ii), (b)-(i), (c)-(iv), (d)-(iii)
 (3) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)
 (4) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)

194. Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) : In human beings. Insulin is synthesized as a pro-hormone which needs to be processed before it becomes fully mature and functional.

Reason (R) : The extra stretch of C-peptide is to be removed from A-peptide and B-peptide chain of insulin.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

- (1) **(A)** is not correct but **(R)** is correct
 (2) Both **(A)** and **(R)** are correct and **(R)** is the correct explanation of **(A)**
 (3) Both **(A)** and **(R)** are correct but **(R)** is not the correct explanation of **(A)**
 (4) **(A)** is correct but **(R)** is not correct

195. Which one of the following features are **not** true for chordates?

- (a) Heart is dorsal.
 (b) Pharynx is perforated by gill slits.
 (c) Central nervous system is ventral, solid and single.
 (d) Post-anal tail is present.
 (e) Notochord is present.

Choose the **most appropriate** answer from the options given below :

- (1) (a), (d) and (c) only
 (2) (b) and (c) only
 (3) (a) and (c) only
 (4) (e) only

196. Match **List - I** with **List - II**

List - I	List - II
(a) Chromoplasts	(i) Proteins
(b) Amyloplasts	(ii) Oil and fats
(c) Elaioplasts	(iii) Starch
(d) Aleuroplasts	(iv) Carotene

Choose the **correct answer** from the options given below :

- (1) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)
 (2) (a)-(iv), (b)-(ii), (c)-(iii), (d)-(i)
 (3) (a)-(iv), (b)-(iii), (c)-(i), (d)-(ii)
 (4) (a)-(iv), (b)-(i), (c)-(iii), (d)-(ii)

197. Match **List - I** with **List - II**

List - I	List - II
(a) <i>Puccinia</i>	(i) Parasitic fungus on mustard
(b) <i>Neurospora</i>	(ii) Dead substrates
(c) Saprophytes	(iii) Wheat rust
(d) <i>Albugo</i>	(iv) Biochemical and Genetic work

Choose the **correct answer** from the options given below :

- (1) (a)-(iii), (b)-(iv), (c)-(ii), (d)-(i)
 (2) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)
 (3) (a)-(iv), (b)-(ii), (c)-(i), (d)-(iii)
 (4) (a)-(iii), (b)-(ii), (c)-(iv), (d)-(i)

198. Select the **correct** match regarding adaptive radiation of Australian marsupials corresponding to placental mammals.

- (1) Tasmanian Wolf - Bobcat
- (2) Marsupial mouse - Mole
- (3) Spotted Cuscus - Lemur
- (4) Numbat - Flying Squirrel

199. Given below are two statements :

Statement-I : When an infected female *Anopheles* mosquito bites, it releases gametocytes of *Plasmodium* into the healthy person.

Statement-II : The female *Anopheles* mosquito takes up sporozoites of *Plasmodium* with blood meal from an infected person, suffering from malaria.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

- (1) **Statement-I** is incorrect but **Statement-II** is correct
- (2) Both **Statement-I** and **Statement-II** are correct
- (3) Both **Statement-I** and **Statement-II** are incorrect
- (4) **Statement-I** is correct but **Statement-II** is incorrect

200. If a DNA molecule is shortened by 25 base pairs, how many helical turns will be reduced from its structure?

- (1) 3
- (2) 2.5
- (3) 2
- (4) 1

ANSWER KEY**NEET(UG)-2022(Overseas)**

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	2	4	3	4	1	4	3	2	4	3	3	3	3	3	4
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	4	4	3	3	3	1	2	1	4	1	4	4	1	4	3
Que.	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Ans.	2	3	3	3	4	3	1	4	4	4	4	4	1	2	2
Que.	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ans.	1	2	3	2	4	2	2	3	4	1	3	2	1	3	1
Que.	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Ans.	1	4	3	2	4	2	2	2	1	3	3	4	3	2	4
Que.	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
Ans.	1	2	3	1	1	3	2	3	1	3	2	2	3	2	3
Que.	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105
Ans.	4	3	3	1	1	3	3	3	4	3	2	3	2	3	3
Que.	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
Ans.	3	3	2	2	3	4	3	4	1	2	4	4	1	2	4
Que.	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135
Ans.	3	3	1	2	2	2	4	1	4	3	2	2	2	2	3
Que.	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
Ans.	3	3	4	4	3	3	3	4	2	3	4	3	4	3	2
Que.	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165
Ans.	2	4	3	3	3	3	1	4	1	2	3	1	1	3	1
Que.	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
Ans.	2	1	2	1	3	2	4	4	4	2	4	4	3	1	4
Que.	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195
Ans.	4	1	1	3	4	1	2	1	3	2	3	2	2	2	3
Que.	196	197	198	199	200										
Ans.	1	1	3	3	2										

HINT - SHEET

1. At $T_1 = 27^\circ\text{C} = 300\text{ K}$

$$\lambda_1 = \lambda$$

$$\text{and } T_2 = 927^\circ\text{C} = 1200\text{ K}$$

$$\lambda_2 = ?$$

$$\therefore \lambda = \frac{h}{p} = \frac{h}{\sqrt{2mE}} \text{ and } E = \frac{3}{2} K_B T$$

$$\therefore \lambda \propto \frac{1}{\sqrt{T}}$$

$$\frac{\lambda_1}{\lambda_2} = \frac{\sqrt{T_2}}{\sqrt{T_1}} = \sqrt{\frac{1200}{300}} = 2$$

$$\lambda_2 = \frac{\lambda_1}{2} = \frac{\lambda}{2}$$

2. Since, $M = IA$

$$\therefore M_1 = M_2 \Rightarrow I_1 \pi r_1^2 = I_2 \pi r_2^2$$

$$\Rightarrow \frac{I_1}{I_2} = \left(\frac{r_2}{r_1} \right)^2 = \frac{4}{1}$$

3. $L = 4H$

$$\therefore \varepsilon = -L \frac{di}{dt} = -4 \frac{(2-4)}{1} = -4(-2) = 8\text{ V}$$

4. Wave is propagating along $-z$ direction

$$\vec{E} = 3\hat{j}\text{ V/m}$$

$$\therefore B_0 = \frac{E_0}{C} = \frac{3}{3 \times 10^8}$$

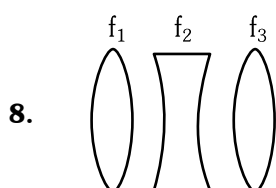
$$= 10 \times 10^{-9} \hat{i} \text{ T} = 10 \hat{i} \text{ nT}$$

5. $\therefore A_V = A_{V_1} A_{V_2}$
 $= 20 \times 20 = 400$

$\frac{V_{out}}{V_{in}} = A_V \Rightarrow V_{out} = A_V(V_{in})$
 $= 400(0.01) = 4$

6. $\therefore I = I_0 \cos^2 \theta$
 $2.5 = 10 \cos^2 \theta \Rightarrow \frac{25}{100} = \cos^2 \theta$
 $\Rightarrow \cos \theta = \frac{1}{2} \Rightarrow \theta = 60^\circ$

7. $v^2 - u^2 = 2gh$
 $\Rightarrow h = \frac{v^2 - u^2}{2g} = \frac{3600 - 1600}{2 \times 10} = 100 \text{ m}$



$f_1 = f_3$

$f_2 = -25 \text{ cm}$

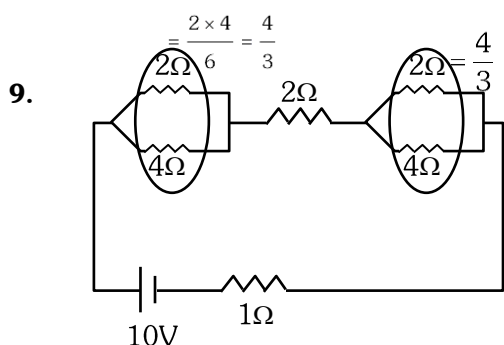
$f_1 = f_3 = 40 \text{ cm}$

$\therefore \frac{1}{f_{net}} = \frac{1}{f_1} + \frac{1}{f_2} + \frac{1}{f_3}$

and $P = \frac{1}{f_{net}(m)}$

$\therefore \frac{1}{f_{net}} = \frac{1}{40} - \frac{1}{25} + \frac{1}{40}$
 $= \frac{2}{40} - \frac{1}{25} = \frac{1}{100 \text{ cm}}$

$\therefore P = \frac{100}{100} = 1D$



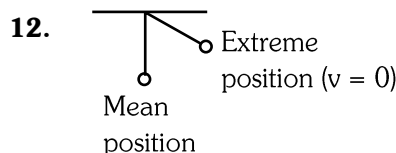
$R_{eq.} = \frac{4}{3} + 2 + \frac{4}{3} + 1 = \frac{8}{3} + 3 = \frac{17}{3} \Omega$

10. Viscosity of liquid decreases with increase of temp.

11. 1st and 2nd excited state of hydrogen corresponds to 2nd and 3rd orbital.
 $n_1 = 2$ and $n_2 = 3$

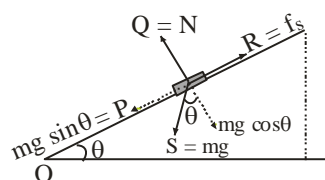
$\therefore L = \frac{nh}{2\pi}$

$\therefore \frac{L_1}{L_2} = \frac{n_1}{n_2} = \frac{2}{3}$



\therefore At extreme position K.E. = 0

So, Total energy = Purely Potential Energy



Q = Normal reaction

$P = mg \sin \theta$

R = Friction force

S = Weight (mg)

(a)-(ii), (b)-(iii), (c)-(iv) and (d)-(i)

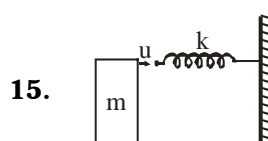
14. \vec{E} at centre = 0

Because of symmetry when one charge is removed

$\vec{E} = \frac{kq}{r^2} = \frac{1}{4\pi\epsilon_0} \frac{q}{r^2}$

($\therefore \vec{E}$ due to 10 charges will cancel and out each other

$\therefore E_{net}$ will be only because of 11th charge)



$\frac{1}{2} mu^2 = \frac{1}{2} kx^2$

$x = u \sqrt{\frac{m}{k}}$

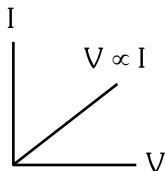
16. $y = \overline{(A+B)} + \overline{(A+B)}$

$$= \overline{(A+B)} \cdot \overline{(A+B)} \quad (\text{By De'Morgans theorem})$$

$$= (A+B) \cdot (A+B)$$

$$= A+B \Rightarrow \text{OR Gate}$$

17. By Ohm's law : $V = IR \Rightarrow V \propto I$



B	B	R	O	Y	G	B	V	G	W
0	1	2	3	4	5	6	7	8	9
↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
Multiplier 1	10	10 ²	10 ³	10 ⁴	10 ⁵	10 ⁶	10 ⁷	10 ⁸	10 ⁹
Tolerance (%) : Gold, Silver, None									
	5	10	20						

$$(360 \pm 18) \text{ k}\Omega$$

19. $E = \frac{1}{2} LI^2$

$$= \frac{1}{2} \times 10 \times 1^2$$

$$= \frac{10}{2} = 5 \text{ J}$$

20. Dimensional formula of mutual inductance
 $= [ML^2T^{-2}A^{-2}]$

21. $\therefore F = q(\vec{v} \times \vec{B})$

Since \vec{v} and \vec{B} are parallel

$$\therefore \theta = 0^\circ$$

$$F_m = Bqv \sin 0^\circ = 0$$

\therefore Original path

22. \therefore Wavelength of blue, indigo and violet light is

less than green light

\therefore Energy of blue, indigo and violet light is more than green light

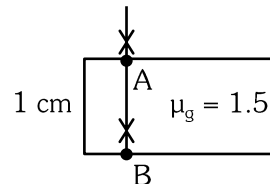
Hence, violet light is capable of ejecting of photoelectron.

23. $\text{Pitch} = \frac{1\text{mm}}{2} = 0.5 \text{ mm}$

$$\text{L.C.} = \frac{\text{Pitch}}{\text{No. of division of circular scale}}$$

$$= \frac{0.5 \times 10^{-3}}{50} = 10^{-5}$$

24.



$$v = \frac{s}{t} \quad \mu_{ga} = \frac{\mu_g}{\mu_a} = \frac{c}{v_g}$$

$$s = 2 \text{ (Thickness of slab)}$$

$$t = \frac{s}{v_g} = \frac{(2 \times 10^{-2}) \times 3}{3 \times 10^8 \times 2}$$

$$\Rightarrow v_g = \frac{c\mu_a}{\mu_g} = \frac{2c}{3} = 10^{10} \text{ s}$$

25. \therefore There is no friction between feet of passenger and floor of bus so passenger will not move back when seen from ground
 So Assertion is false but reason is true.

26. $\therefore Q = ms \Delta T$

$$\text{as } \Delta T = 0$$

$$s = Q/m\Delta T = \infty$$

27. By using Bernoulli's equation

$$p + \frac{1}{2} \rho v^2 + \rho gh = \text{constant}$$

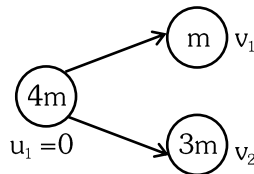
28. $N = N_0 e^{-\lambda t}$

$$\ln N = \ln N_0 + \ln(e^{-\lambda t})$$

$$\ln N = -\lambda t + \ln N_0$$

$$\therefore \text{Slope} = -\lambda$$

29.



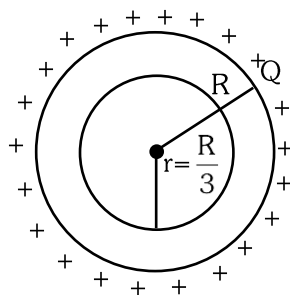
$$\therefore F_{\text{ext}} = 0 \therefore \Delta P = 0$$

$$\Rightarrow P_1 + P_2 = 0 \Rightarrow P_1 = -P_2$$

$$\text{and } E = \frac{p^2}{2m}$$

$$\therefore E \propto \frac{1}{m} \Rightarrow \frac{E_1}{E_2} = \frac{3m}{m} = \frac{3}{1}$$

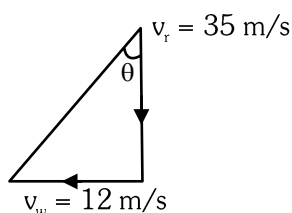
30.



Here potential inside sphere will be equal to potential on surface of sphere.

$$V = \frac{kQ}{R} = \frac{1}{4\pi\epsilon_0} \frac{Q}{R}$$

31.



$$\tan\theta = \frac{12}{35} \Rightarrow \theta = \tan^{-1}\left(\frac{12}{35}\right) \text{ w.r.t rain}$$

32. $\therefore I \propto mR^2$

$$\frac{m_1}{m_2} = \frac{1}{1}$$

$$\frac{R_1}{R_2} = \frac{1}{2}$$

$$\therefore \frac{I_1}{I_2} = \frac{m_1}{m_2} \times \left(\frac{R_1}{R_2}\right)^2$$

$$= 1 \times \left(\frac{1}{2}\right)^2 = \frac{1}{4}$$

33. $I = 0.1 \text{ Kg m}^2$

$$r = 10 \times 10^{-2} \text{ m}$$

$$F = 10 \text{ N}$$

$$t = 2 \text{ sec}$$

$$\therefore \tau = I\alpha = rF$$

$$\therefore \alpha = \frac{rF}{I} = \frac{10^{-1} \times 10}{10^{-1}} = 10 \text{ rads}^{-2}$$

$$\therefore \omega = \omega_0 + \alpha t$$

$$\therefore \omega = 0 + \alpha t$$

$$\Rightarrow \omega = 10 \times 2 = 20 \text{ rads}^{-1}$$

34. Acceleration due to gravity acting on a body is independent of the mass of the body.

$$\left(\because g = \frac{GM}{R^2}\right)$$

35.

R → Radio

m → Micro

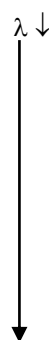
I → Infrared

V → Visible

U → UV ray

X → X-ray

G → γ-ray



$$\lambda_m > \lambda_I > \lambda_X > \lambda_\gamma$$

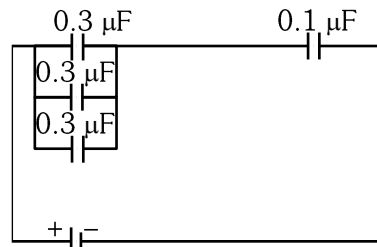
$$36. \frac{N_0 - N}{N_0} = \frac{N_0 - N_0 e^{-\lambda t}}{N_0} = 1 - e^{-\lambda t}$$

$$t = T_{av} = \frac{1}{\lambda}$$

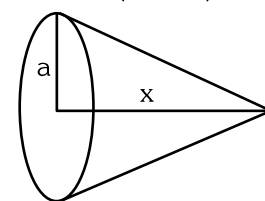
$$So = 1 - e^{-\lambda/\lambda} = 1 - e^{-1} = \frac{e-1}{e}$$

$$37. \therefore C_{eq.} = \frac{C_1 \times C_2}{C_1 + C_2}$$

$$C_{eq.} = \frac{0.9 \times 0.1 \times 10^{-12}}{1 \times 10^{-6}} = 0.09 \mu\text{F}$$



$$38. \therefore B = \frac{\mu_0}{2} \frac{Ia^2}{(a^2 + x^2)^{3/2}}$$



When, $x \gg a$

$$\text{Then, } B = \frac{\mu_0}{2} \frac{Ia^2}{(x^2)^{3/2}} = \frac{\mu_0}{2} \frac{Ia^2}{x^3}$$

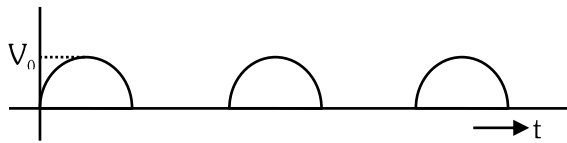
Magnetic field on axis of dipole

$$B = \frac{\mu_0}{2\pi} \frac{M}{x^3}$$

$$B \propto \frac{1}{x^3}$$

\therefore Statement I correct and statement II incorrect.

39. Consider diode 'D' as ideal diode.



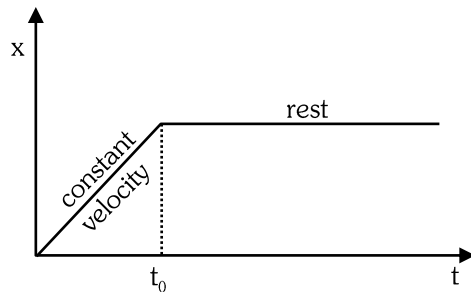
40. $\frac{1}{2}mv^2 = \frac{kq_1q_2}{r}$

$$\Rightarrow r \propto \frac{1}{v^2}$$

$$\frac{r_1}{r_2} = \left(\frac{v_2}{v_1}\right)^2 = \left(\frac{2v}{v}\right)^2 = 4$$

$$\Rightarrow r_2 = \frac{r_1}{4} = \frac{r}{4}$$

- 41.



42. $\therefore V_{\text{rms}} = \sqrt{\frac{3RT}{M}}$

$$\therefore V_{\text{Ne}} = V_{\text{H}_2}$$

$$\Rightarrow \sqrt{\frac{3RT}{20.2}} = \sqrt{\frac{3R(288)}{2}}$$

$$\Rightarrow \frac{T}{20.2} = \frac{288}{2}$$

$$\Rightarrow T = 2.9 \times 10^3 \text{ K}$$

43. Work done $= 8\pi T(r_2^2 - r_1^2)$

$$= 8\pi T(4r^2 - r^2) = 24\pi r^2 T$$

44. $\oint \vec{B} \cdot d\vec{s} = 0$

\therefore Magnetic monopoles do not exist.

45. According to question

$$f = 500 \times 10^{12} \text{ Hz}$$

$$d = 0.2 \times 10^{-3} \text{ m}$$

$$D = 1 \text{ m}$$

$$n = 10$$

$$\beta = \frac{n\lambda D}{d} \text{ and } f = \frac{c}{\lambda} \Rightarrow \lambda = \frac{c}{f}$$

$$\text{So, } \beta = n \times \frac{c}{f} \cdot \frac{D}{d}$$

$$= 10 \times \frac{3 \times 10^7}{500 \times 10^{12}} \times \frac{1}{0.2 \times 10^{-4}} = 0.03 \text{ m} = 30 \text{ mm}$$

46. According to question

$$V = V_m \sin \omega t$$

$$I = I_m \sin(\omega t - \pi/2) = -I_m \cos \omega t$$

$$\therefore P_{\text{inst.}} = VI$$

$$\therefore P_{\text{inst.}} = -(V_m \sin \omega t)(I_m \cos \omega t) \times \frac{2}{2}$$

$$= \frac{-V_m I_m}{2} \sin(2\omega t)$$

47. $\frac{\ell_1}{\ell_2} = \frac{30}{70} = \frac{X}{Y}$

$$\Rightarrow X = \frac{3}{7} Y \quad \dots(1)$$

$$\frac{50}{50} = \frac{X}{YR/R+Y} = \frac{1}{1}$$

$$\Rightarrow X = \frac{YR}{R+Y}$$

$$\Rightarrow \frac{3}{7} Y = \frac{YR}{Y+R}$$

$$\Rightarrow 3(Y+R) = 7R$$

$$\Rightarrow 3Y + 3R = 7R$$

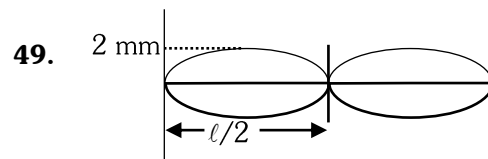
$$\Rightarrow 3Y = 4R$$

$$\Rightarrow Y = \frac{4R}{3} = \frac{4 \times 16}{3} = \frac{64}{3}$$

48. According to question

$$\therefore T^2 \propto R^3$$

$$\therefore \frac{T^2}{x^2} \propto \frac{R^3}{64R^3} \Rightarrow x^2 = 64T^2 \Rightarrow x = 8T$$



$$\ell = \lambda; 2A = \text{amplitude at anti node} = 2\text{mm}$$

$$\text{Amplitude} = 2A \sin kx$$

$$= 2\text{mm} \sin \frac{2\pi}{\lambda} \left(\frac{\ell}{8}\right)$$

$$= 2\text{mm} \sin \left(\frac{\pi \lambda}{\lambda 4}\right) = 2\text{mm} \sin \left(\frac{\pi}{4}\right)$$

$$= \frac{2\text{mm}}{\sqrt{2}} = \sqrt{2} \text{ mm}$$

50. $g = 4\pi^2 \frac{L}{T^2}$

$$\therefore \frac{\Delta g}{g} = \frac{\Delta L}{L} + \frac{2\Delta T}{T}$$

51.

Polymer	Monomer
Bakelite	Phenol and formaldehyde
Nylon 6, 6	Hexamethylenediamine and adipic acid
Nylon 6	Caprolactam
Terylene	Ethylene glycol and Benzene-1, 4-dicarboxylic acid

52. Ga^+ is more stable than Al^+ as inert pair effect becomes more effective down the group.

53. All three C–O bonds are equal in length with a bond order in between 1 and 2 due to resonance.

54. An electron in Hydrogen atom will have least amount of energy because value of n (principal quantum number) is least which is 1.

55. Volume of the gas is due to the large number of molecules of the gas is not correct because volume of the gas is equal to volume of container.

56. $W = -2.303 nRT \log \left(\frac{p_1}{p_2} \right)$

$$W = -2.303 \times 1 \text{ mol} \times 8.314 \frac{\text{J}}{\text{Kmol}} \times 300 \text{ K} \times \log \left(\frac{5 \text{ atm}}{1 \text{ atm}} \right)$$

$$W = -2.303 \times 8.314 \times 300 \times 1 \times \log 5$$

$$W = -2.303 \times 8.314 \times 300 \times 0.6989$$

$$W = -4014.58 \text{ J}$$

57. LiF is sparingly soluble in water because it has high lattice enthalpy which dominates hydration enthalpy.

58. $BiH_3 > SbH_3 > NH_3 > AsH_3 > PH_3$

Top to bottom, molecule weight increases so boiling point increases but due to H-Bonding in NH_3 , the order becomes


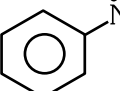
$BiH_3 > SbH_3 > NH_3 > AsH_3 > PH_3$

59. All the domains get oriented in the direction of magnetic field.

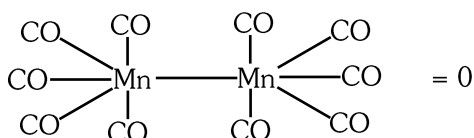
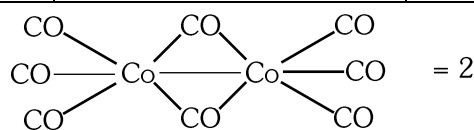
↑ ↑ ↑ ↑ ↑ ↑

60. Because last carbon (asymmetrical) has –OH group on left hand side.

61.

	Amines	pK_b
(a)	$CH_3-\ddot{N}-CH_3$ H	3.27
(b)	$\ddot{N}H_3$	4.75
(c)	$H-\ddot{N}-CH_3$ 	9.30
(d)	 - $\ddot{N}H_2$	9.38

62.

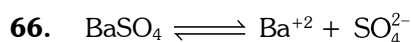
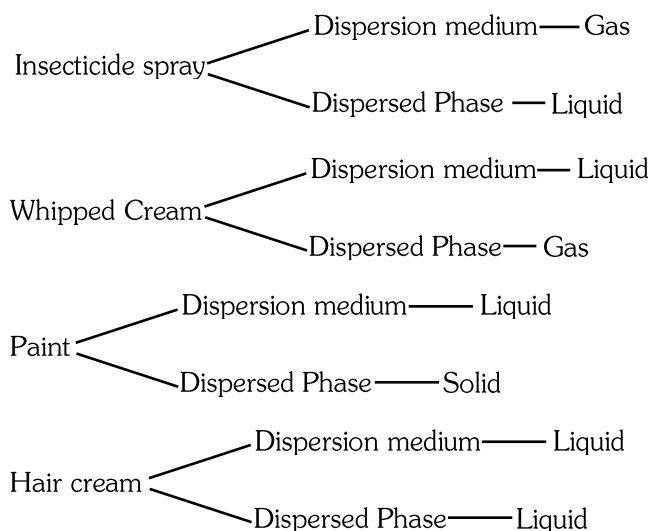


63.

(a)	Element which exhibits +3 oxidation state only	(iii)	Sc $[1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^1]$ $Sc^{+3} [1s^2 2s^2 2p^6 3s^2 3p^6 4s^0 3d^0]$
(b)	Element which exhibits more number of oxidation states	(i)	Mn $[1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^5]$ (oxidation state from +2 to +7)
(c)	Element which is a reducing agent in its +2 oxidation state	(iv)	Cr $[1s^2 2s^2 2p^6 3s^2 3p^6 4s^1 3d^5]$ $Cr^{+2} [1s^2 2s^2 2p^6 3s^2 3p^6 4s^0 3d^4]$ Cr^{+2} acts as a reducing agent, Cr^{+3} is stable because of its configuration - $t_{2g}^3 e_g^0$.
(d)	Element which is not considered as a transition element	(ii)	Zn $[1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10}]$ $Zn^{+2} [1s^2 2s^2 2p^6 3s^2 3p^6 4s^0 3d^{10}]$ as it is pseudo transition element.

64. Bromination product depends on nature of solvent. CHCl_3 gives monosubstituted bromo derivative as CHCl_3 is a solvent of low polarity whereas reaction of phenol with bromine water yields trisubstituted bromo derivative of phenol.

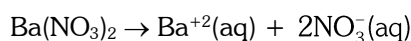
65.



$$K_{sp} = [\text{Ba}^{+2}][\text{SO}_4^{2-}]$$

$$= 1.5 \times 10^{-9} = S^2$$

$$S = \sqrt{1.5 \times 10^{-9}} = 3.87 \times 10^{-5}$$



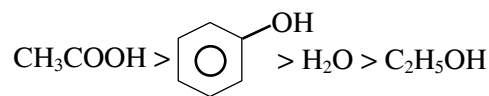
$$[\text{Due to common ion}] \rightarrow (0.1 + S') (S') = K_{sp}$$

$$(0.1) \times S' = 1.5 \times 10^{-9} \quad (\because 0.1 \gg S')$$

$$S' = 1.5 \times 10^{-8} \text{ M}$$

67. (a) Alcohols are weaker acids than water because alkoxide are better proton acceptor than hydroxide.
- (b) Phenols are better acids than alcohols because phenoxide ion is more stable by resonance.

- (c) CH_3COOH is acid, with acid strength greater than all and have $\text{pK}_a = 4.76$



68. $\text{N}_2 = (\text{B.O.} = 3)$

$$\text{O}_2 = (\text{B.O.} = 2)$$

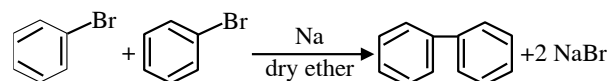
$$\text{O}_2^- = (\text{B.O.} = 1.5)$$

$$\text{O}_2^{2-} = (\text{B.O.} = 1)$$

$$\text{Bond order} \propto \text{Bond enthalpies}$$

$$\text{So, } \text{N}_2 > \text{O}_2 > \text{O}_2^- > \text{O}_2^{2-}$$

69.



Fittig reaction

70. Aldehydes and ketones having at least one α -hydrogen undergo a reaction in the presence of dilute alkali as catalyst to form β -hydroxy aldehydes (aldol) or β -hydroxy ketones (ketol), respectively. This is known as Aldol reaction.
71. (1) It is a true statement
(2) It is a true statement
(3) It is incorrect or false statement.
(4) It is a also a true statement
72. Relative lowering in vapour pressure = Mole fraction of solute

$$\begin{aligned} \therefore x_{\text{solute}} &= \frac{n_{\text{solute}}}{n_{\text{solute}} + n_{\text{solvent}}} \\ &= \frac{1}{1+3} \\ &= \frac{1}{4} = 0.25 \end{aligned}$$

73. List-I Elements	List-II Atomic radii (pm)
(a) O	(iii) 66 pm
(b) C	(iv) 77 pm
(c) B	(i) 88 pm
(d) N	(ii) 74 pm

$$B > C > N > O$$

As we move across the period from left to right atomic radius decreases due to increase in nuclear charge.

74. Boiling point increases with increase in number of carbon atoms and decreases with branching.

Option (a) has 5 carbon atoms but

Option (b) has 6 carbon atoms

∴ B.P. of (b) > (a)

Option (c) and (d) have '5' carbon atoms each but option (c) has one branch and option (d) has two branches.

∴ B.P. of (c) > (d)

∴ Order of B.P. : b > a > c > d

75. The alkali metals and their salts impart characteristic colour in an oxidising flame. This is because the heat from the flame excites the valence electron which comes back to the ground state to emit light of wavelength in visible region.

76. The species which can undergo both oxidation and reduction exhibit disproportionation reactions.

i.e., If the central atom is the species which can show both increase and decrease in O.N. then it shows disproportionation reaction.

Clearly Option 2, 3, 4 are not possible as they all have ClO_4^- as common species which is having Cl already in +7 oxidation state.

77. Rate = $K[A]^2$

(d) If the concentration of reactant is doubled the rate of reaction will increase four times as per the rate equation.

$$\text{i.e., rate} = K[2K]^2$$

$$\text{rate} = 4K$$

(b) Rate constant is independent of concentration but temperature dependent.

78. Knowledge based

79. (a) 4.48 litres of O_2 at STP \rightarrow 6.4 g

$$n_{\text{O}_2} = \frac{V}{22.4} = \frac{4.48}{22.4} = 0.2 \text{ moles}$$

$$w = n \times M_{\text{O}_2} = 0.2 \times 32 = 6.4 \text{ g}$$

- (b) 12.022×10^{22} molecules of $\text{H}_2\text{O} \rightarrow$ 0.2 moles

$$n_{\text{H}_2\text{O}} = \frac{N}{N_A} = \frac{12.022 \times 10^{22}}{6.022 \times 10^{23}} = 2 \times 10^{-1} = 0.2 \text{ moles}$$

- (c) 96 g of $\text{O}_2 \rightarrow$ 67.2 litres at STP

$$\frac{w}{M} = \frac{V}{22.4}$$

$$\frac{96}{32} = \frac{V}{22.4} \quad V = \frac{96 \times 22.4}{32} = 67.2 \text{ litres}$$

- (d) 88 g of $\text{CO}_2 \rightarrow 12.044 \times 10^{23}$ molecules

$$\frac{w}{M} = \frac{N}{N_A} \quad \therefore \frac{88}{44} = \frac{N}{6.022 \times 10^{23}}$$

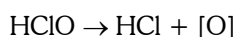
$$N = 6.022 \times 10^{23} \times 2$$

$$= 12.044 \times 10^{23} \text{ molecules}$$

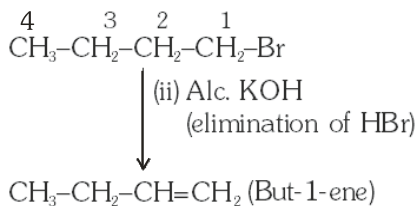
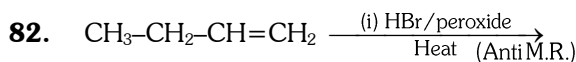
80. Knowledge based

81. Chlorine reacts with water to form HCl and HClO.

But HClO (hypochlorous acid) is unstable and easily dissociates to form nascent oxygen



Nascent oxygen is a more powerful oxidising agent which is responsible for the bleaching nature.



83. formula $\Delta G^\circ = -nFE^\circ_{\text{cell}}$

(a) $n = 6 \quad \therefore \Delta G^\circ = -6 \times F \times 0.404$
 $= -2.424 F$

(b) $n = 2 \quad \therefore \Delta G^\circ = -2 \times F \times 1.211$
 $= -2.422 F$

(c) $n = 3 \quad \therefore \Delta G^\circ = -3 \times F \times 0.807$
 $= -2.421 F$

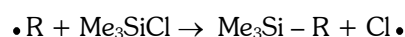
84. Order of reactivity of alcohols towards acid catalyst dehydration is

$$3^\circ > 2^\circ > 1^\circ$$

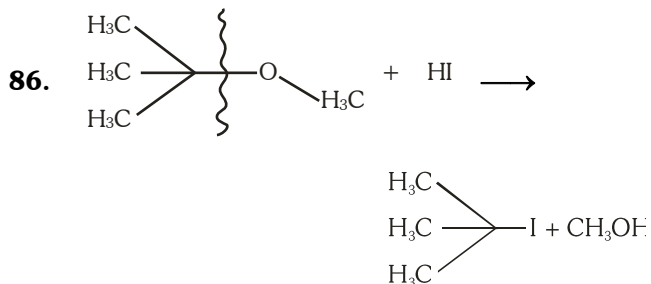
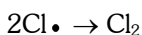
$\therefore a < c < d$ but option (2) is least because OH group is attached sp^2 hybridised carbon atom and partial bond character develops between C-OH bond.

85. The chain length of the silicone polymer can be controlled by adding Me_3SiCl [CH_3] $_3\text{SiCl}$.

The reaction of the sequence can be represented as :

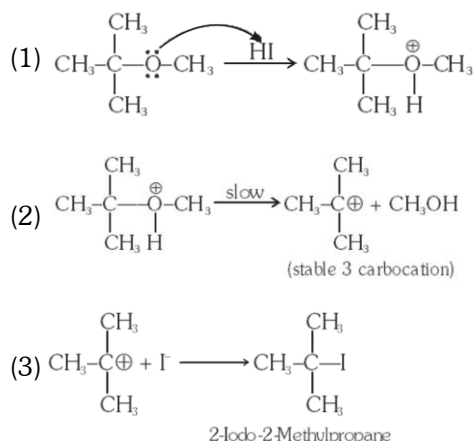


This blocks the end of the silicon polymer and thus terminates the chain propagation.



Whenever one of the alkyl group is a tertiary group, the halide formed is a tertiary halide.

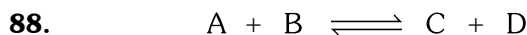
Mechanism :



87. The amount of BOD in water is a measure of the amount of organic matter in the water, in terms of how much oxygen will be required to break it down biologically.

If BOD < 5 ppm (clean water)

If BOD \geq 17 ppm (highly polluted water)



$$t=0, n = \quad 1 \quad 1 \quad 0 \quad 0$$

$$t=t_{\text{eq}}, n = \quad 1-x \quad 1-x \quad x \quad x$$

$$\text{Moles of C at equilibrium} = x = 0.7$$

\therefore Concentrations at equilibrium are :

$$[\text{A}] = \frac{n}{V} = \frac{1-x}{1} = 1 - 0.7 = 0.3$$

$$[\text{B}] = \frac{n}{V} = \frac{1-x}{1} = 1 - 0.7 = 0.3$$

$$[\text{C}] = \frac{n}{V} = \frac{x}{1} = 0.7$$

$$[\text{D}] = \frac{n}{V} = \frac{x}{1} = 0.7$$

$$K_C = \frac{[\text{C}][\text{D}]}{[\text{A}][\text{B}]} = \frac{0.7 \times 0.7}{0.3 \times 0.3} = \frac{49}{9} = 5.4 \text{ (approx)}$$

89. We know, $\Lambda_m = \frac{\kappa \times 1000}{M}$

On putting values,

$$\Lambda_m = \frac{(4.95 \times 10^{-5}) \times 1000}{0.001028}$$

$$= 48.15 \text{ S cm}^2 \text{ mol}^{-1}$$

$$\text{Now, } \Lambda_m^\circ = \Lambda_m^\circ(\text{CH}_3\text{COONa}) + \Lambda_m^\circ(\text{HCl}) - \Lambda_m^\circ(\text{NaCl})$$

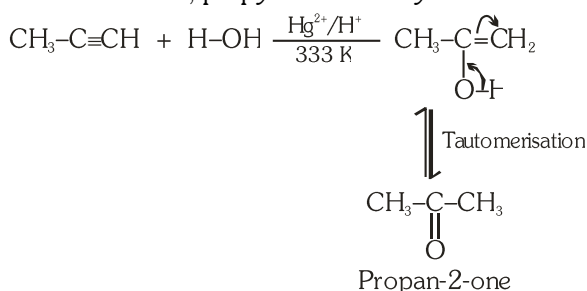
$$= 91.05 + 425.9 - 126.4$$

$$= 390.55 \text{ S cm}^2 \text{ mol}^{-1}$$

$$\alpha = \frac{\Lambda_m}{\Lambda_m^\circ} = \frac{48.15}{390.55} = 0.123$$

90. Hydration of Ethyne gives aldehyde but hydration of alkynes having more than 2 carbons gives ketone.

Lets assume, propyne as our alkyne.

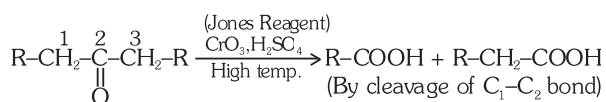


91. Ellingham diagram provides an idea or gives a prediction about the feasibility of thermal reduction of an ore.

Ellingham diagram do not deal with the kinetics of a reduction reaction.

92. Ketones are oxidised under vigorous conditions i.e., strong oxidising agents and at elevated temperature.

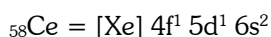
Oxidation involves carbon-carbon cleavage to form mixture of carboxylic acids having less number of carbon atoms than parent ketone



Cleavage of C₂-C₃ bond also gives same product.

93. ${}_{63}\text{Eu} = [\text{Xe}]4f^7 6s^2$

Eu^{2+} is a strong reducing agent changing to common +3 state.



Ce(IV) is a strong oxidant.

$$E^\circ \text{ of } \text{Ce}^{4+}/\text{Ce}^{3+} = 1.74 \text{ V}$$

The E_r° of Ce suggests that it can oxidise water.

94. (P) Power = 1 mW = 10^{-3} watt

$$E = P \times t = 10^{-3} \times 0.1 = 10^{-4} \text{ J}$$

$$\lambda = 1000 \text{ nm} = 1000 \times 10^{-9} \text{ m} = 10^{-6} \text{ m}$$

We know,

$$E = nh\nu$$

Here, E = Energy of n photons

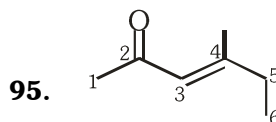
n = number of photons

$h\nu$ = energy of 1 photon

$$10^{-4} = n \times \frac{hc}{\lambda}$$

$$10^{-4} = \frac{n \times (6.626 \times 10^{-34}) \times (3 \times 10^8)}{10^{-6}}$$

$$n = 5 \times 10^{14} \text{ photons}$$



Longest parent chain is selected by giving lowest numbering to ketone.

IUPAC name – 4-methyl hex-3-en-2-one

96. Moles of gas is conserved

$$n_{\text{total}} = n_A + n_B$$

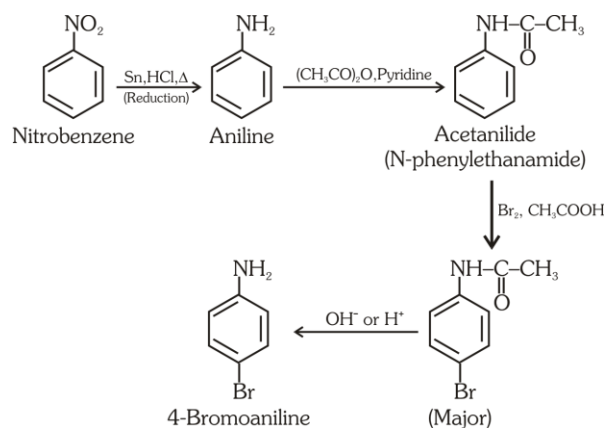
Assuming gases as ideal, $n = \frac{PV}{RT}$

$$\frac{PV}{RT} = \frac{P_1 V_1}{RT} + \frac{P_2 V_2}{RT}$$

$$P_{\text{total}} = \frac{P_1 V_1 + P_2 V_2}{V_{\text{total}}} = \frac{1 \times 250 + 2 \times 500}{1000 \text{ ml}}$$

$$= 1.25 \text{ bar}$$

- 97.



98. $\text{Cl}^- \rightarrow$ Weak field ligand (no pairing occurs)

$\text{H}_2\text{O} \rightarrow$ Weak field ligand (no pairing occurs)

$\text{CN}^- \rightarrow$ Strong field ligand (no pairing occurs)

$\text{Mn} = [\text{Ar}]3\text{d}^5 4\text{s}^2$

$\text{Mn}^{3+} = [\text{Ar}] 3\text{d}^4$ no. of unpaired $e^- = 4$

$\text{Co} = [\text{Ar}]3\text{d}^7 4\text{s}^2$

$\text{Co}^{2+} = [\text{Ar}] 3\text{d}^7$ no. of unpaired $e^- = 3$

$\text{Fe} = [\text{Ar}]3\text{d}^6 4\text{s}^2$

$\text{Fe}^{3+} = [\text{Ar}] 3\text{d}^5$

1	1	1	1	1
---	---	---	---	---

On pairing

$\uparrow\downarrow$	$\uparrow\downarrow$	1		
----------------------	----------------------	---	--	--

no. of unpaired $e^- = 1$

So, spin magnetic moment answer :

$[\text{MnCl}_6]^{3-} > [\text{Co}(\text{H}_2\text{O})_6]^{2+} > [\text{Fe}(\text{CN})_6]^{3-}$

99. In case of semiconductor, the gap between valence band and conduction band is small.

Therefore option (4) is incorrect as here it is mentioned conduction band and valence band overlaps which happens in conductors actually.

100. We know, Arrhenius equation

$$\ln K = \ln A - \frac{E_a}{RT}$$

$$y = C + mx$$

$$\text{So, slope} = -\frac{E_a}{R} = -1 \times 10^4 \text{ K}$$

$$\text{So, } E_a = 10^4 R$$

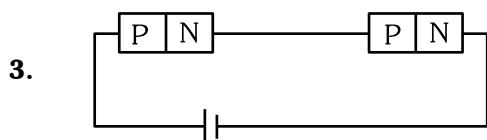
$$= 10^4 \times 8.3$$

$$= 8.3 \times 10^4 \text{ J mol}^{-1}$$

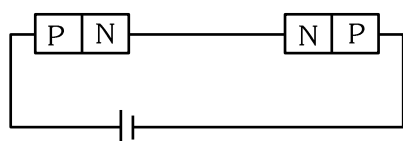
NEET(UG) – 2022

Section-A (Physics)

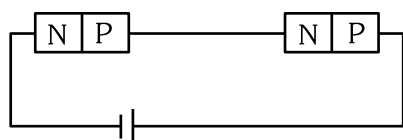
- Two hollow conducting spheres of radii R_1 and R_2 ($R_1 \gg R_2$) have equal charges. The potential would be :
 (1) more on smaller sphere
 (2) equal on both the spheres
 (3) dependent on the material property of the sphere
 (4) more on bigger sphere
- The angular speed on a fly wheel moving with uniform angular acceleration changes from 1200 rpm to 3120 rpm in 16 seconds. The angular acceleration in rad/s^2 is :
 (1) 4π (2) 12π (3) 104π (4) 2π



(a)



(b)

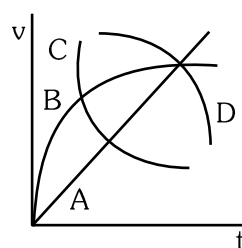


(c)

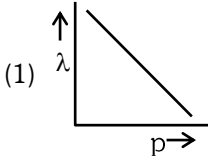
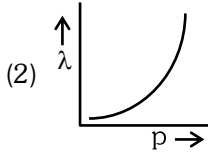
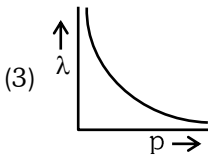
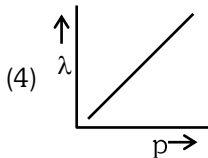
In the given circuits (a), (b) and (c), the potential drop across the two p-n junctions are equal in :

- (1) Circuit (b) only
 - (2) Circuit (c) only
 - (3) Both circuits (a) and (c)
 - (4) Circuit (a) only
- Two objects of mass 10 kg and 20 kg respectively are connected to the two ends of a rigid rod of length 10 m with negligible mass. The distance of the center of mass of the system from the 10 kg mass is :
 (1) $\frac{20}{3}$ m (2) 10 m
 (3) 5 m (4) $\frac{10}{3}$ m

- A biconvex lens has radii of curvature, 20 cm each. if the refractive index of the material of the lens is 1.5, the power of the lens is :-
 (1) +20 D (2) +5D
 (3) infinity (4) +2D
- A spherical ball is dropped in a long column of a highly viscous liquid. The curve in the graph shown, which represents the speed of the ball (v) as a function of time (t) is :



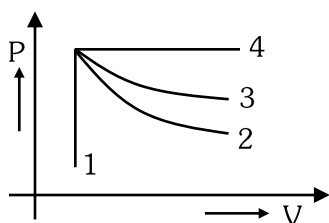
- (1) B (2) C
 (3) D (4) A
- The ratio of the radius of gyration of a thin uniform disc about an axis passing through its centre and normal to its plane to the radius of gyration of the disc about its diameter is :
 (1) $\sqrt{2} : 1$
 (2) 4 : 1
 (3) $1 : \sqrt{2}$
 (4) 2 : 1
- A shell of mass m is at rest initially. It explodes into three fragments having mass in the ratio 2 : 2 : 1. If the fragments having equal mass fly off along mutually perpendicular directions with speed v , the speed of the third (lighter) fragment is
 (1) $\sqrt{2} v$
 (2) $2\sqrt{2} v$
 (3) $3\sqrt{2} v$
 (4) v

9. A long solenoid of radius 1 mm has 100 turns per mm. If 1A current flows in the solenoid, the magnetic field strength at the centre of the solenoid is
 (1) $12.56 \times 10^{-2} \text{ T}$ (2) $12.56 \times 10^{-4} \text{ T}$
 (3) $6.28 \times 10^{-4} \text{ T}$ (4) $6.28 \times 10^{-2} \text{ T}$
10. Let T_1 and T_2 be the energy of an electron in the first and second excited states of hydrogen atom, respectively. According to the Bohr's model of an atom, the ratio $T_1 : T_2$ is :
 (1) 4 : 1 (2) 4 : 9
 (3) 9 : 4 (4) 1 : 4
11. A light ray falls on a glass surface of refractive index $\sqrt{3}$, at an angle 60° . The angle between the refracted and reflected rays would be :
 (1) 60° (2) 90°
 (3) 120° (4) 30°
12. If a soap bubble expands, the pressure inside the bubble :
 (1) increases
 (2) remains the same
 (3) is equal to the atmospheric pressure
 (4) decreases
13. Plane angle and solid angle have :
 (1) Dimensions but no units
 (2) No units and no dimensions
 (3) Both units and dimensions
 (4) Units but no dimensions
14. When light propagates through a material medium of relative permittivity ϵ_r and relative permeability μ_r , the velocity of light, v is given by: (c-velocity of light in vacuum)
 (1) $v = \sqrt{\frac{\mu_r}{\epsilon_r}}$
 (2) $v = \sqrt{\frac{\epsilon_r}{\mu_r}}$
 (3) $v = \frac{c}{\sqrt{\epsilon_r \mu_r}}$
 (4) $v = c$
15. Two resistors of resistance, 100Ω and 200Ω are connected in parallel in an electrical circuit. The ratio of the thermal energy developed in 100Ω to that in 200Ω in a given time is :
 (1) 2 : 1 (2) 1 : 4
 (3) 4 : 1 (4) 1 : 2
16. The graph which shows the variation of the de Broglie wavelength (λ) of a particle and its associated momentum (p) is :
 (1) 
 (2) 
 (3) 
 (4) 
17. A square loop of side 1 m and resistance 1Ω is placed in a magnetic field of 0.5 T. If the plane of loop is perpendicular to the direction of magnetic field, the magnetic flux through the loop is :
 (1) 0.5 weber
 (2) 1 weber
 (3) Zero weber
 (4) 2 weber
18. The dimensions $[\text{MLT}^{-2} \text{ A}^{-2}]$ belong to the :
 (1) self inductance
 (2) magnetic permeability
 (3) electric permittivity
 (4) magnetic flux
19. When two monochromatic lights of frequency, ν and $\frac{\nu}{2}$ are incident on a photoelectric metal, their stopping potential becomes $\frac{V_s}{2}$ and V_s respectively. The threshold frequency for this metal is:
 (1) 3ν (2) $\frac{2}{3}\nu$
 (3) $\frac{3}{2}\nu$ (4) 2ν

20. In half wave rectification, if the input frequency is 60 Hz, then the output frequency would be :

- (1) 30 Hz
- (2) 60 Hz
- (3) 120 Hz
- (4) Zero

21. An ideal gas undergoes four different processes from the same initial state as shown in the figure below . Those processes are adiabatic, isothermal, isobaric and isochoric. The curve which represents the adiabatic process among 1,2,3 and 4 is :



- (1) 2
- (2) 3
- (3) 4
- (4) 1

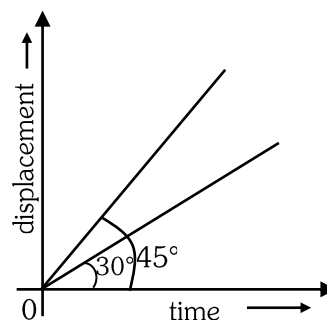
22. Match List – I with List –II

	List –I (Electromagnetic waves)		List-II (Wavelength)
(a)	AM radio waves	(i)	10^{-10} m
(b)	Microwaves	(ii)	10^2 m
(c)	Infrared radiations	(iii)	10^{-2} m
(d)	X-rays	(iv)	10^{-4} m

Choose the **correct** answer from the options given below :

- (1) (a) – (iii), (b) – (ii), (c) – (i), (d) – (iv)
- (2) (a) – (iii), (b) – (iv), (c) – (ii), (d) – (i)
- (3) (a) – (ii), (b) – (iii), (c) – (iv), (d) – (i)
- (4) (a) – (iv), (b) – (iii), (c) – (ii), (d) – (i)

23. The displacement-time graphs of two moving particles make angles of 30° and 45° with the x-axis as shown in the figure. The ratio of their respective velocity is :



- (1) 1 : 1
- (2) 1 : 2
- (3) $1 : \sqrt{3}$
- (4) $\sqrt{3} : 1$

24. In a Young's double slit experiment, a student observes 8 fringes in a certain segment of screen when a monochromatic light of 600 nm wavelength is used. If the wavelength of light is changed to 400 nm, then the number of fringes he would observe in the same region of the screen is :

- (1) 8
- (2) 9
- (3) 12
- (4) 6

25. The peak voltage of the ac source is equal to:

- (1) the rms value of the ac source
- (2) $\sqrt{2}$ times the rms value of the ac source
- (3) $1/\sqrt{2}$ time the rms value of the ac source
- (4) the value of voltage supplied to the circuit.

26. If the initial tension on a stretched string is doubled, then the ratio of the initial and final speeds of a transverse wave along the string is:

- (1) $\sqrt{2} : 1$
- (2) $1 : \sqrt{2}$
- (3) 1:2
- (4) 1:1

27. Given below are two statements:

Statement I :

Biot-Savart's law gives us the expression for the magnetic field strength of an infinitesimal current element (Idl) of a current carrying conductor only.

Statement II :

Biot-Savart's law is analogous to Coulomb's inverse square law of charge q , with the former being related to the field produced by a scalar source, Idl while the latter being produced by a vector source, q .

In light of above statement choose the most **appropriate** answer from the options given below:

- (1) Both statement I and Statement II are incorrect
- (2) Statement I is correct and Statement II is incorrect
- (3) Statement I is incorrect and Statement II is correct
- (4) Both statement I and Statement II are correct

28. As the temperature increase, the electrical resistance :

- (1) decreases for both conductors and semiconductors
- (2) increases for conductors but decreases for semiconductors
- (3) decreases for conductors but increase for semiconductors
- (4) increases for both conductors and semiconductors.

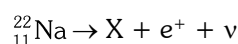
29. The energy that will be ideally radiated by a 100 kW transmitter in 1 hour is :

- (1) 36×10^4 J
- (2) 36×10^5 J
- (3) 1×10^5 J
- (4) 36×10^7 J

30. A body of mass 60 g experiences a gravitational force of 3.0 N, when placed at a particular point. The magnitude of the gravitational field intensity at that point is:

- (1) 50 N/kg
- (2) 20 N/kg
- (3) 180 N/kg
- (4) 0.05 N/kg

31. In the given nuclear reaction, the element X is:



- (1) ${}_{10}^{23}\text{Ne}$
- (2) ${}_{10}^{22}\text{Ne}$
- (3) ${}_{12}^{22}\text{Mg}$
- (4) ${}_{11}^{23}\text{Na}$

32. The angle between the electric lines of force and the equipotential surface is:

- (1) 45°
- (2) 90°
- (3) 180°
- (4) 0°

33. A copper wire of length 10 m and radius $(10^{-2} / \pi)$ m has electrical resistance of 10 Ω .

The current density in the wire for an electric field strength of 10 (V/m) is:

- (1) 10^6 A/m²
- (2) 10^{-5} A/m²
- (3) 10^5 A/m²
- (4) 10^4 A/m²

34. The ratio of the distances travelled by a freely falling body in the 1st, 2nd, 3rd and 4th second :

- (1) 1 : 4 : 9 : 16
- (2) 1 : 3 : 5 : 7
- (3) 1 : 1 : 1 : 1
- (4) 1 : 2 : 3 : 4

35. An electric lift with a maximum load of 2000 kg (lift + passengers) is moving up with a constant speed of 1.5 ms⁻¹. The frictional force opposing the motion is 3000 N. The minimum power delivered by the motor to the lift in watts is:

$$(g = 10 \text{ ms}^{-2})$$

- (1) 20000
- (2) 34500
- (3) 23500
- (4) 23000

Section-B (Physics)

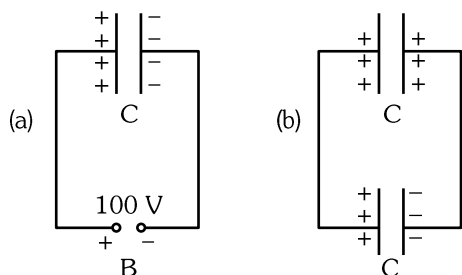
36. The volume occupied by the molecules contained in 4.5 kg water at STP, if the intermolecular forces vanish away is:

- (1) 5.6×10^3 m³
- (2) 5.6×10^{-3} m³
- (3) 5.6 m³
- (4) 5.6×10^6 m³

37. The area of a rectangular field (in m^2) of length 55.3 m and breadth 25 m after rounding off the value for correct significant digits is :

(1) 1382 (2) 1382.5
(3) 14×10^2 (4) 138×10^1

38. A capacitor of capacitance $C = 900 \text{ pF}$ is charged fully by 100 V battery B as shown in figure (a). Then it is disconnected from the battery and connected to another uncharged capacitor of capacitance $C = 900 \text{ pF}$ as shown in figure (b). The electrostatic energy stored by the system (b) is:



(1) $3.25 \times 10^{-6} \text{ J}$ (2) $2.25 \times 10^{-6} \text{ J}$
(3) $1.5 \times 10^{-6} \text{ J}$ (4) $4.5 \times 10^{-6} \text{ J}$

39. Match **List - I** with **List - II** :

List - I		List - II	
(a)	Gravitational constant (G)	(i)	$[\text{L}^2\text{T}^{-2}]$
(b)	Gravitational potential energy	(ii)	$[\text{M}^{-1}\text{L}^3\text{T}^{-2}]$
(c)	Gravitational potential	(iii)	$[\text{LT}^{-2}]$
(d)	Gravitational intensity	(iv)	$[\text{ML}^2\text{T}^{-2}]$

Choose the **correct answer** from the options given below :

(1) (a)–(ii), (b)–(iv), (c)–(i), (d)– (iii)
(2) (a)–(ii), (b)–(iv), (c)–(iii), (d)– (i)
(3) (a)–(iv), (b)–(ii), (c)–(i), (d)– (iii)
(4) (a)–(ii), (b)–(i), (c)–(iv), (d)– (iii)

40. Two pendulums of length 121 cm and 100 cm start vibrating in phase. At some instant, the two are at their mean position in the same phase. The minimum number of vibrations of the shorter pendulum after which the two are again in phase at the mean position is :

(1) 9 (2) 10 (3) 8 (4) 11

41. Given below are two statements: One is labelled as Assertion (A) and the other is labelled as Reason (R).

Assertion (A):

The stretching of a spring is determined by the shear modulus of the material of the spring.

Reason (R):

A coil spring of copper has more tensile strength than a steel spring of same dimensions.

In the light of the above statements, choose the most appropriate answer from the options given below:

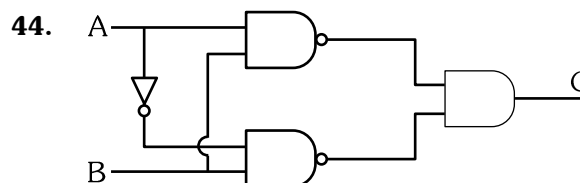
(1) Both (A) and (R) are true and (R) is not the correct explanation of (A)
(2) (A) is true but (R) is false
(3) (A) is false but (R) is true
(4) Both (A) and (R) are true and (R) is the correct explanation of (A)

42. A ball is projected with a velocity, 10 ms^{-1} , at an angle of 60° with the vertical direction. Its speed at the highest point of its trajectory will be:

(1) $5\sqrt{3}\text{ms}^{-1}$ (2) 5 ms^{-1}
(3) 10 ms^{-1} (4) Zero

43. Two transparent media A and B are separated by a plane boundary. The speed of light in those media are $1.5 \times 10^8 \text{ m/s}$ and $2.0 \times 10^8 \text{ m/s}$, respectively. The critical angle for a ray of light for these two media is:

(1) $\sin^{-1}(0.750)$ (2) $\tan^{-1}(0.500)$
(3) $\tan^{-1}(0.750)$ (4) $\sin^{-1}(0.500)$



The truth table for the given logic circuit is :

A B C			A B C		
0	0	1	0	0	1
0	1	0	0	1	0
1	0	0	1	0	1
1	1	1	1	1	0

A B C			A B C		
0	0	0	0	0	0
0	1	1	0	1	1
1	0	0	1	0	1
1	1	1	1	1	0

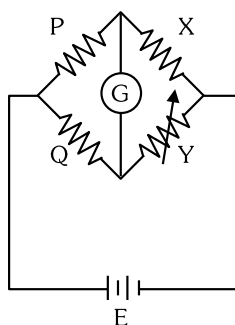
(1) (2) (3) (4)

(1) (2) (3) (4)

45. A series LCR circuit with inductance 10 H, capacitance 10 μF , resistance 50 Ω is connected to an ac source of voltage, $V = 200 \sin(100t)$ volt. If the resonant frequency of the LCR circuit is ν_0 and the frequency of the ac source is ν , then

- (1) $\nu_0 = \nu = \frac{50}{\pi} \text{ Hz}$
- (2) $\nu_0 = \frac{50}{\pi} \text{ Hz}$, $\nu = 50 \text{ Hz}$
- (3) $\nu = 100 \text{ Hz}$; $\nu_0 = \frac{100}{\pi} \text{ Hz}$
- (4) $\nu_0 = \nu = 50 \text{ Hz}$

46. A wheatstone bridge is used to determine the value of unknown resistance X by adjusting the variable resistance Y as shown in the figure. For the most precise measurement of X, the resistances P and Q :

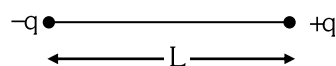


- (1) should be approximately equal and are small
 - (2) should be very large and unequal
 - (3) do not play any significant role
 - (4) should be approximately equal to $2X$
47. From Ampere's circuital law for a long straight wire of circular cross-section carrying a steady current, the variation of magnetic field in the inside and outside region of the wire is:
- (1) a linearly increasing function of distance upto the boundary of the wire and then linearly decreasing for the outside region.
 - (2) a linearly increasing function of distance r upto the boundary of the wire and then decreasing one with $1/r$ dependence for the outside region.
 - (3) a linearly decreasing function of distance upto the boundary of the wire and then a linearly increasing one for the outside region.
 - (4) uniform and remains constant for both the regions.

48. A big circular coil of 1000 turns and average radius 10 m is rotating about its horizontal diameter at 2 rad s^{-1} . If the vertical component of earth's magnetic field at that place is $2 \times 10^{-5} \text{ T}$ and electrical resistance of the coil is 12.56 Ω , then the maximum induced current in the coil will be :

- (1) 1.5 A
- (2) 1 A
- (3) 2 A
- (4) 0.25 A

49. Two point charges $-q$ and $+q$ are placed at a distance of L , as shown in the figure.



The magnitude of electric field intensity at a distance

R ($R \gg L$) varies as :

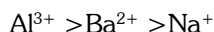
- (1) $\frac{1}{R^3}$
 - (2) $\frac{1}{R^4}$
 - (3) $\frac{1}{R^6}$
 - (4) $\frac{1}{R^2}$
50. A nucleus of mass number 189 splits into two nuclei having mass number 125 and 64. The ratio of radius of two daughter nuclei respectively is:
- (1) 4 : 5
 - (2) 5 : 4
 - (3) 25 : 16
 - (4) 1 : 1

Section-A (Chemistry)

51. Given below are two statements:

Statement I :

In the coagulation of a negative sol, the flocculating power of the three given ions is in the order -



Statement II :

In the coagulation of a positive sol, the flocculating power of the three given salts is in the order -



In the light of the above statements, choose the most appropriate answer from the options given below:

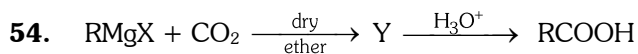
- (1) Both statement I and statement II are incorrect.
- (2) Statement I is correct but statement II is incorrect
- (3) Statement I is incorrect but statement II is correct.
- (4) Both statements I and statements II are correct.

52. Which statement regarding polymers is not correct ?

- (1) Fibers possess high tensile strength.
- (2) Thermoplastic polymers are capable of repeatedly softening and hardening on heating and cooling respectively.
- (3) Thermosetting polymers are reusable.
- (4) Elastomers have polymer chains held together by weak intermolecular forces.

53. The incorrect statement regarding chirality is:

- (1) The product obtained by $\text{S}_\text{N}2$ reaction of haloalkane having chirality at the reactive site shows inversion of configuration,
- (2) Enantiomers are superimposable mirror images of each other.
- (3) A racemic mixture shows zero optical rotation.
- (4) $\text{S}_\text{N}1$ reaction yields 1 : 1 mixture of both enantiomers.



What is Y in the above reaction :

- (1) $\text{R}_3\text{CO-Mg}^+ \text{X}$
- (2) RCOO-X^+
- (3) $(\text{RCOO})_2\text{Mg}$
- (4) $\text{RCOO-Mg}^+ \text{X}$

55. In one molal solution that contains 0.5 mole of a solute, there is

- (1) 500 g of solvent
- (2) 100 mL of solvent
- (3) 1000 g of solvent
- (4) 500 mL of solvent

56. Match **List-I** with **List-II**

List- I
(Hydrides)

- (a) MgH_2
- (b) GeH_4
- (c) B_2H_6
- (d) HF

List-II
(Nature)

- (i) Electron precise
- (ii) Electron deficient
- (iii) Electron rich
- (iv) Ionic

Choose the correct answer from the options given below :

- (1) (a)-(iii), (b) - (i), (c) - (ii), (d)- (iv)
- (2) (a)-(i), (b) - (ii), (c) - (iv), (d)- (iii)
- (3) (a)-(ii), (b) - (iii), (c) - (iv), (d)- (i)
- (4) (a) -(iv), (b) - (i), (c) - (ii), (d)- (iii)

57. Given below are two statements : -

Statement I :

The boiling points of aldehydes and ketones are higher than hydrocarbons of comparable molecular masses because of weak molecular association in aldehydes and ketones due to dipole - dipole interactions.

Statements II :

The boiling points aldehydes and ketones are lower than the alcohols of similar molecular masses due to the absence of H-bonding.

In the light of the statements, choose the most appropriate answer from the options given below:

- (1) Both statements I and statements II are incorrect.
- (2) Statement I is correct but statements II is incorrect
- (3) Statements I is incorrect but statements II is correct.
- (4) Both statements I and statements II are correct.

58. Match **List-I** with **List -II**.

List-I (Products formed)	List-II (Reaction of carbonyl compound with)
------------------------------------	--

- | | |
|-------------------|----------------------------|
| (a) Cyanohydrin | (i) NH_2OH |
| (b) Acetal | (ii) RNH_2 |
| (c) Schiff's base | (iii) alcohol |
| (d) Oxime | (iv) HCN |

Choose the correct answer from the options given below :

- (1) (a)-(ii), (b) - (iii), (c) - (iv), (d)- (i)
 (2) (a)-(i), (b) - (iii), (c) - (ii), (d)- (iv)
 (3) (a)-(iv), (b) - (iii), (c) - (ii), (d)- (i)
 (4) (a) -(iii), (b) - (iv), (c) - (ii), (d)- (i)

59. Which one is **not** correct mathematical equation for Dalton's Law of partial pressure ?

Here p = total pressure of gaseous mixture

(1) $p = n_1 \frac{RT}{V} + n_2 \frac{RT}{V} + n_3 \frac{RT}{V}$

(2) $p_i = \chi_i p$, where p_i = partial pressure of i^{th} gas

χ_i = mole fraction of i^{th} gas in gaseous mixture

(3) $p_i = \chi_i p_i^\circ$, where χ_i = mole fraction of i^{th} gas in gaseous mixture
 p_i° = pressure of i^{th} gas in pure state

(4) $p = p_1 + p_2 + p_3$

60. Match **List-I** with **List-II**.

	List-I (Drug class)		List-II (Drug molecule)
(a)	Antacids	(i)	Salvarsan
(b)	Antihistamines	(ii)	Morphine
(c)	Analgesics	(iii)	Cimetidine
(d)	Antimicrobials	(iv)	Seldane

Choose the correct answer from the options given below:

- (1) (a)-(iii), (b)-(iv), (c)-(ii), (d)-(i)
 (2) (a)-(i), (b)-(iv), (c)-(ii), (d)- (iii)
 (3) (a)-(iv), (b)-(iii), (c)-(i), (d)-(ii)
 (4) (a)-(iii), (b)-(ii), (c)-(iv), (d)-(i)

61. Given below are two statements:

Statement I :

The boiling points of the following hydrides of group 16 elements increases in the order -



Statement II:

The boiling points of these hydrides increase with increase in molar mass.

In the light of the above statements, choose the **most appropriate** answer from the options given below:

- (1) Both **Statement I** and **Statement II** are incorrect
 (2) **Statement I** is correct but **Statement II** is incorrect
 (3) **Statement I** is incorrect but **Statement II** is correct
 (4) Both **Statement I** and **Statement II** are correct

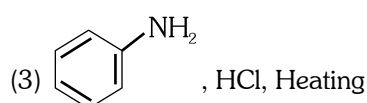
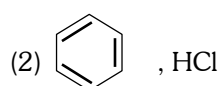
62. The IUPAC name of the complex -



- (1) diaquasilver(II) dicyanidoargentate(II)
 (2) dicyanidosilver(I) diaquaargentate(I)
 (3) diaquasilver(I) dicyanidoargentate(I)
 (4) dicyanidosilver(II) diaquaargentate(II)

63. Which of the following is suitable to synthesize chlorobenzene ?

- (1) Phenol, NaNO_2 , HCl , CuCl



- (4) Benzene, Cl_2 , anhydrous FeCl_3

64. Given below are two statements; one is labelled as **Assertion (A)** and the other is labelled as **Reason(R)**.

Assertion (A) : ICl is more reactive than I₂.

Reason(R) : I-Cl bond is weaker than I-I bond.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

- (1) Both **(A)** and **(R)** are correct but **(R)** is not the correct explanation of **(A)**.
- (2) **(A)** is correct but **(R)** is not correct.
- (3) **(A)** is not correct but **(R)** is correct.
- (4) Both **(A)** and **(R)** are correct and **(R)** is the correct explanation of **(A)**.

65. The IUPAC name of an element with atomic number 119 is

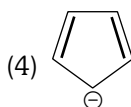
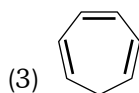
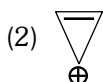
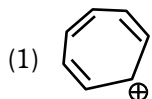
- (1) unnilennium
- (2) unununnium
- (3) ununoctium
- (4) ununennium

66. At 298 K, the standard electrode potentials of Cu²⁺/Cu, Zn²⁺/Zn, Fe²⁺/Fe and Ag⁺/Ag are 0.34V, - 0.76 V, - 0.44 V and 0.80 V, respectively.

On the basis of standard electrode potential, predict which of the following reaction can not occur ?

- (1) CuSO₄(aq) + Fe(s) → FeSO₄(aq) + Cu(s)
- (2) FeSO₄(aq) + Zn(s) → ZnSO₄(aq) + Fe(s)
- (3) 2CuSO₄(aq) + 2Ag(s) → 2Cu(s) + Ag₂SO₄(aq)
- (4) CuSO₄(aq) + Zn(s) → ZnSO₄(aq) + Cu(s)

67. Which compound amongst the following is not an aromatic compound ?



68. Choose the correct statement :

- (1) Diamond is covalent and graphite is ionic.
- (2) Diamond is sp³ hybridised and graphite is sp² hybridized.
- (3) Both diamond and graphite are used as dry lubricants.
- (4) Diamond and graphite have two dimensional network.

69. Given below are two statements :

Statement I :

Primary aliphatic amines react with HNO₂ to give unstable diazonium salts.

Statement II :

Primary aromatic amines react with HNO₂ to form diazonium salts which are stable even above 300 K.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

- (1) Both **Statement-I** and **Statement-II** are incorrect.
- (2) **Statement-I** is correct but **Statement-II** is incorrect.
- (3) **Statement-I** is incorrect but **Statement-II** is correct.
- (4) Both **Statement-I** and **Statement-II** are correct.

70. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) :

In a particular point defect, an ionic solid is electrically neutral, even if few of its cations are missing from its unit cells.

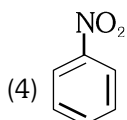
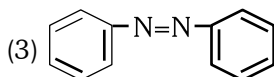
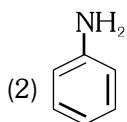
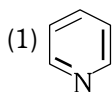
Reason (R) :

In an ionic solid, Frenkel defect arises due to dislocation of cation from its lattice site to interstitial site, maintaining overall electrical neutrality.

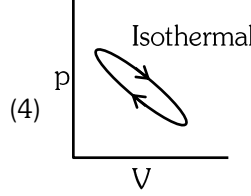
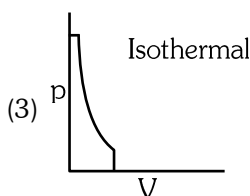
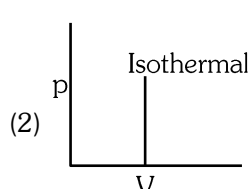
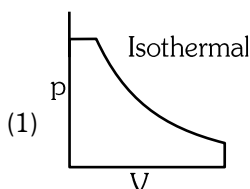
In the light of the above statements, choose the most appropriate answer from the options given below:

- (1) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
- (2) (A) is correct but (R) is not correct
- (3) (A) is not correct but (R) is correct.
- (4) Both (A) and (R) are correct and (R) is the correct explanation of (A)

71. The Kjeldahl's method for the estimation of nitrogen can be used to estimate the amount of nitrogen in which one of the following compounds ?



72. Which of the following p-V curve represents maximum work done ?



73. Which of the following statement is **not** correct about diborane ?

- (1) The four terminal B-H bonds are two centre - two electron bonds.
- (2) The four terminal Hydrogen atoms and the two Boron atoms lie in one plane.
- (3) Both the Boron atoms are sp^2 hybridised
- (4) There are two 3-centre-2-electron bonds.

74. The pH of the solution containing 50 mL each of 0.10 M sodium acetate and 0.01 M acetic acid is [Given pK_a of $CH_3COOH = 4.57$]

- (1) 3.57
- (2) 4.57
- (3) 2.57
- (4) 5.57

75. Which amongst following is **incorrect** statement?

- (1) C_2 molecule has four electrons in its two degenerate π molecular orbitals.
- (2) H_2^+ ion has one electron
- (3) O_2^+ ion is diamagnetic.
- (4) The bond orders of O_2^+ , O_2 , O_2^- and O_2^{2-} are 2.5, 2, 1.5 and 1, respectively.

76. Amongst the following which one will have maximum 'lone pair-lone pair' electron repulsions?

- (1) IF_5
- (2) SF_4
- (3) XeF_2
- (4) ClF_3

77. What mass of 95% pure $CaCO_3$ will be required to neutralise 50 mL of 0.5 M HCl solution according to the following reaction ?



[Calculate upto second place of decimal point]

- (1) 1.32 g
- (2) 3.65 g
- (3) 9.50 g
- (4) 1.25 g

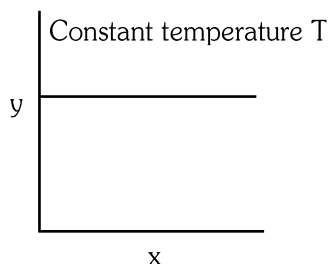
78. Identify the **incorrect** statement from the following

- (1) The oxidation number of K in KO_2 is + 4.
- (2) Ionisation enthalpy of alkali metals decreases from top to bottom in the group.
- (3) Lithium is the strongest reducing agent among the alkali metals.
- (4) Alkali metals react with water to form their hydroxides.

79. Gadolinium has a low value of third ionisation enthalpy because of

- (1) high exchange enthalpy
- (2) high electronegativity
- (3) high basic character
- (4) small size

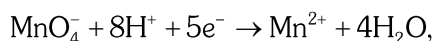
80. The given graph is a representation of kinetics of a reaction.



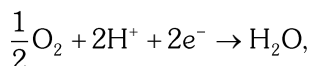
The y and x axes for zero and first order reactions, respectively are

- (1) zero order (y =concentration and x = time),
first order (y = rate constant and
 x = concentration)
 - (2) zero order (y = rate and x =concentration),
first order (y = $t_{1/2}$ and x =concentration)
 - (3) zero order (y = rate and x = concentration),
first order (y = rate and x = $t_{1/2}$)
 - (4) zero order (y =concentration and x = time),
first order (y = $t_{1/2}$ and x = concentration)
81. The incorrect statement regarding enzymes is:
- (1) Like chemical catalysts enzymes reduce the activation energy of bio processes.
 - (2) Enzymes are polysaccharides.
 - (3) Enzymes are very specific for a particular reaction and substrate.
 - (4) Enzymes are biocatalysts.
82. Identify the **incorrect** statement from the following.
- (1) All the five 4d orbitals have shapes similar to the respective 3d orbitals.
 - (2) In an atom, all the five 3d orbitals are equal in energy in free state.
 - (3) The shapes of d_{xy} , d_{yz} , and d_{zx} orbitals are similar to each other; and $d_{x^2-y^2}$ and d_{z^2} are similar to each other.
 - (4) All the five 5d orbitals are different in size when compared to the respective 4d orbitals

83. Given below are half cell reactions :



$$E_{\text{Mn}^{2+}/\text{MnO}_4^-}^\circ = -1.510 \text{ V}$$



$$E_{\text{O}_2/\text{H}_2\text{O}}^\circ = +1.223 \text{ V}$$

Will the permanganate ion, MnO_4^- liberate O_2 from water in the presence of an acid ?

- (1) No, because $E_{\text{cell}}^\circ = -0.287 \text{ V}$
- (2) Yes, because $E_{\text{cell}}^\circ = +2.733 \text{ V}$
- (3) No, because $E_{\text{cell}}^\circ = -2.733 \text{ V}$
- (4) Yes, because $E_{\text{cell}}^\circ = +0.287 \text{ V}$

84. Match **List-I** with **List-II**.

List-I

List-II

- | | |
|---------|--|
| (a) Li | (i) absorbent for carbon dioxide |
| (b) Na | (ii) electrochemical cells |
| (c) KOH | (iii) coolant in fast breeder reactors |
| (d) Cs | (iv) photoelectric cell |

Choose the **correct answer** from the options given below :

- (1) (a)-(iii), (b)-(iv), (c)-(ii), (d)-(i)
 - (2) (a)-(i), (b)-(iii), (c)-(iv), (d)-(ii)
 - (3) (a)-(ii), (b)-(iii), (c)-(i), (d)-(iv)
 - (4) (a)-(iv), (b)-(i), (c)-(iii), (d)-(ii)
85. Given below are two statements:

Statement I:

The acidic strength of monosubstituted nitrophenol is higher than phenol because of electron withdrawing nitro group.

Statement II:

o-nitrophenol, m-nitrophenol and p-nitrophenol will have same acidic strength as they have one nitro group attached to the phenolic ring.

In the light of the above statements, choose the most appropriate answer from the options given below:

- (1) Both **Statement I** and **Statement II** are incorrect.
- (2) **Statement I** is correct but **Statement II** is incorrect.
- (3) **Statement I** is incorrect but **Statement II** is correct
- (4) Both **Statement I** and **Statement II** are correct

Section-B (Chemistry)

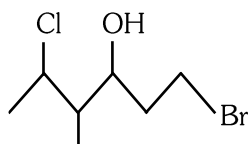
86. The pollution due to oxides of sulphur gets enhanced due to the presence of:

(a) particulate matter
(b) ozone
(c) hydrocarbons
(d) hydrogen peroxide

Choose the most appropriate answer from the options given below:

(1) (a),(b),(d) only
(2) (b),(c),(d) only
(3) (a), (c),(d) only
(4) (a), (d) only

87. The correct IUPAC name of the following compound is :



(1) 6-bromo-2-chloro-4-methylhexan-4-ol
(2) 1-bromo-4-methyl-5-chlorohexan-3-ol
(3) 6-bromo-4-methyl-2-chlorohexan-4-ol
(4) 1-bromo-5-chloro-4-methylhexan-3-ol

88. $3\text{O}_2(\text{g}) \rightleftharpoons 2\text{O}_3(\text{g})$

for the above reaction at 298 K, K_c is found to be 3.0×10^{-59} . If the concentration of O_2 at equilibrium is 0.040 M then concentration of O_3 in M is

(1) 1.9×10^{-63} (2) 2.4×10^{31}
(3) 1.2×10^{21} (4) 4.38×10^{-32}

89. Match List-I with List-II.

List-I

(Ores)

(a) Haematite
(b) Magnetite
(c) Calamine
(d) Kaolinite

List-II

(Composition)

(i) Fe_3O_4
(ii) ZnCO_3
(iii) Fe_2O_3
(iv) $[\text{Al}_2(\text{OH})_4\text{Si}_2\text{O}_5]$

Choose the correct answer from the options given below :

(1) (a)-(iii), (b)-(i), (c)-(ii), (d)-(iv)
(2) (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii)
(3) (a)-(i), (b)-(iii), (c)-(ii), (d)-(iv)
(4) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)

90. Given below are two statements :

Statement I:

In Lucas test, primary, secondary and tertiary alcohols are distinguished on the basis of their reactivity with conc. $\text{HCl} + \text{ZnCl}_2$, known as Lucas Reagent.

Statement II:

Primary alcohols are most reactive and immediately produce turbidity at room temperature on reaction with Lucas Reagent.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both **Statement I** and **Statement II** are incorrect.
(2) **Statement I** is correct but **Statement II** is incorrect.
(3) **Statement I** is incorrect but **Statement II** is correct
(4) Both **Statement I** and **Statement II** are correct

91. In the neutral or faintly alkaline medium, KMnO_4 oxidises iodide into iodate. The change in oxidation state of manganese in this reaction is from

(1) +6 to +4 (2) +7 to +3
(3) +6 to +5 (4) +7 to +4

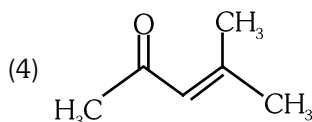
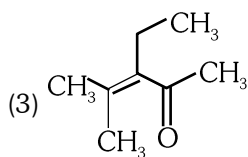
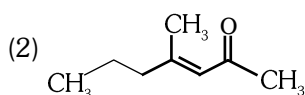
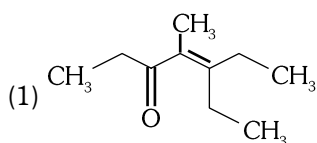
92. For a first order reaction $\text{A} \rightarrow \text{Products}$, initial concentration of A is 0.1 M, which becomes 0.001 M after 5 minutes. Rate constant for the reaction in min^{-1} is

(1) 0.9212
(2) 0.4606
(3) 0.2303
(4) 1.3818

93. Compound X on reaction with O_3 followed by $\text{Zn}/\text{H}_2\text{O}$ gives formaldehyde and 2-methyl propanal as products. The compound X is :

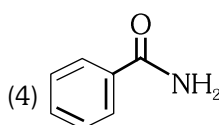
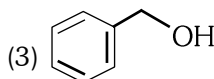
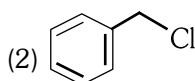
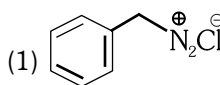
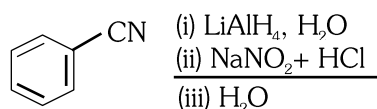
(1) 2-Methylbut-1-ene
(2) 2-Methylbut-2-ene
(3) Pent-2-ene
(4) 3-Methylbut-1-ene

94. A 10.0 L flask contains 64 g of oxygen at 27°C. (Assume O₂ gas is behaving ideally). The pressure inside the flask in bar is
(Given R = 0.0831 L bar K⁻¹ mol⁻¹)
(1) 498.6 (2) 49.8
(3) 4.9 (4) 2.5
95. The order of energy absorbed which is responsible for the color of complexes
(A) [Ni(H₂O)₂(en)₂]²⁺
(B) [Ni(H₂O)₄(en)]²⁺ and
(C) [Ni(en)₃]²⁺
(1) (C) > (B) > (A)
(2) (C) > (A) > (B)
(3) (B) > (A) > (C)
(4) (A) > (B) > (C)
96. Which one of the following is not formed when acetone reacts with 2-pentanone in the presence of dilute NaOH followed by heating ?



97. Find the emf of the cell in which the following reaction takes place at 298 K
Ni(s) + 2Ag⁺(0.001 M) → Ni²⁺(0.001 M) + 2Ag(s)
(Given that E_{cell}^o = 10.5 V, $\frac{2.303RT}{F} = 0.059$ at 298 K)
(1) 1.385 V (2) 0.9615 V
(3) 1.05 V (4) 1.0385 V

98. If radius of second Bohr orbit of the He⁺ ion is 105.8 pm, what is the radius of third Bohr orbit of Li²⁺ ion?
(1) 15.87 pm
(2) 1.587 pm
(3) 158.7 Å
(4) 158.7 pm
99. Copper crystallises in fcc unit cell with cell edge length of 3.608 × 10⁻⁸ cm. The density of copper is 8.92 g cm⁻³. Calculate the atomic mass of copper.
(1) 31.55 u
(2) 60 u
(3) 65 u
(4) 63.1 u
100. The product formed from the following reaction sequence is



Section-A (Biology : Botany)

101. Read the following statements about the vascular bundles :

- (a) In roots, xylem and phloem in a vascular bundle are arranged in an alternate manner along the different radii.
- (b) Conjoint closed vascular bundles do not possess cambium
- (c) In open vascular bundles, cambium is present in between xylem and phloem
- (d) The vascular bundles of dicotyledonous stem possess endarch protoxylem
- (e) In monocotyledonous root, usually there are more than six xylem bundles present

Choose the **correct answer** from the options given below :

- (1) (b), (c), (d) and (e) only
- (2) (a), (b), (c) and (d) only
- (3) (a), (c), (d) and (e) only
- (4) (a), (b) and (d) only

102. Identify the **correct** set of statements:

- (a) The leaflets are modified into pointed hard thorns in *Citrus* and *Bougainvillea*
- (b) Axillary buds form slender and spirally coiled tendrils in cucumber and pumpkin
- (c) Stem is flattened and fleshy in *Opuntia* and modified to perform the function of leaves
- (d) *Rhizophora* shows vertically upward growing roots that help to get oxygen for respiration
- (e) Subaerially growing stems in grasses and strawberry help in vegetative propagation

Choose the **correct answer** from the options given below:

- (1) (a) and (d) Only
- (2) (b), (c), (d) and (e) Only
- (3) (a), (b), (d) and (e) Only
- (4) (b) and (c) Only

103. The appearance of recombination nodules on homologous chromosomes during meiosis characterizes:

- (1) Bivalent
- (2) Sites at which crossing over occurs
- (3) Terminalization
- (4) Synaptonemal complex

104. Read the following statements and choose the set of **correct** statements:

- (a) Euchromatin is loosely packed chromatin
- (b) Heterochromatin is transcriptionally active
- (c) Histone octamer is wrapped by negatively charged DNA in nucleosome
- (d) Histones are rich in lysine and arginine
- (e) A typical nucleosome contains 400 bp of DNA helix

Choose the **correct answer** from the options given below:

- (1) (a), (c), (d) Only
- (2) (b), (e) Only
- (3) (a), (c), (e) Only
- (4) (b), (d), (e) Only

105. Given below are two statements :

Statement I:

The primary CO_2 acceptor in C_4 plants is phosphoenolpyruvate and is found in the mesophyll cells.

Statement II:

Mesophyll cells of C_4 plants lack RuBisCo enzyme.

In the light of the above statements, choose the correct answer from the options given below:

- (1) Both **Statement I** and **Statement II** are incorrect
- (2) **Statement I** is correct but **Statement II** is incorrect
- (3) **Statement I** is incorrect but **Statement II** is correct
- (4) Both **Statement I** and **Statement II** are correct

106. Identify the incorrect statement related to Pollination:

- (1) Pollination by wind is more common amongst abiotic pollination
- (2) Flowers produce foul odours to attract flies and beetles to get pollinated
- (3) Moths and butterflies are the most dominant pollinating agents among insects
- (4) Pollination by water is quite rare in flowering plants

107. Which one of the following statement is **not true** regarding gel electrophoresis technique ?

- (1) The separated DNA fragments are stained by using ethidium bromide.
- (2) The presence of chromogenic substrate gives blue coloured DNA bands on the gel.
- (3) Bright orange coloured bands of DNA can be observed in the gel when exposed to UV light.
- (4) The process of extraction of separated DNA strands from gel is called elution.

108. Habitat loss and fragmentation, over exploitation, alien species invasion and co-extinction are causes for:

- (1) Competition
- (2) Biodiversity loss
- (3) Nataliy
- (4) Population explosion

109. Production of Cucumber has increased manifold in recent years. Application of which of the following phytohormones has resulted in this increased yield as the hormone is known to produce female flowers in the plants:

- (1) Gibberellin
- (2) Ethylene
- (3) Cytokinin
- (4) ABA

110. What is the net gain of ATP when each molecule of glucose is converted to two molecules of pyruvic acid ?

- | | |
|-----------|----------|
| (1) Six | (2) Two |
| (3) Eight | (4) Four |

111. Given below are two statements:

Statement I:

Cleistogamous flowers are invariably autogamous

Statement II:

Cleistogamy is disadvantageous as there is no chance for cross pollination.

In the light of the above statements, choose the correct answer from the options given below:

- (1) Both **Statement I** and **Statement II** are incorrect
- (2) **Statement I** is correct but **Statement II** is incorrect
- (3) **Statement I** is incorrect but **Statement II** is correct
- (4) Both **Statement I** and **Statement II** are correct

112. Hydrocolloid carrageen is obtained from :

- (1) Phaeophyceae and Rhodophyceae
- (2) Rhodophyceae only
- (3) Phaeophyceae only
- (4) Chlorophyceae and Phaeophyceae

113. "Girdling Experiment" was performed by Plant Physiologists to identify the plant tissue through which:

- (1) food is transported
- (2) for both water and food transportation
- (3) osmosis is observed
- (4) water is transported

114. Which of the following is **incorrectly** matched ?

- (1) *Ulothrix* - Mannitol
- (2) *Porphyra* - Floridian Starch
- (3) *Volvox* - Starch
- (4) *Ectocarpus* - Fucoxanthin

115. DNA polymorphism forms the basis of:

- (1) DNA finger printing
- (2) Both genetic mapping and DNA finger printing
- (3) Translation
- (4) Genetic mapping

116. Match **List-I** with **List-II**.

List-I	List-II
(a) Manganese	(i) Activates the enzyme catalase
(b) Magnesium	(ii) Required for pollen germination
(c) Boron	(iii) Activates enzymes of respiration
(d) Iron	(iv) Functions in splitting of water during photosynthesis

Choose the **correct answer** from the options given below:

- (1) (a) - (iv), (b) - (iii), (c) - (ii), (d) - (i)
- (2) (a) - (iv), (b) - (i), (c) - (ii), (d) - (iii)
- (3) (a) - (iii), (b) - (i), (c) - (ii), (d) - (iv)
- (4) (a) - (iii), (b) - (iv), (c) - (i), (d) - (ii)

117. The process of translation of mRNA to proteins begins as soon as :

- (1) The larger subunit of ribosome encounters mRNA
- (2) Both the subunits join together to bind with mRNA
- (3) The tRNA is activated and the larger subunit of ribosome encounters mRNA
- (4) The small subunit of ribosome encounters mRNA

118. The device which can remove particulate matter present in the exhaust from a thermal power plant is:

- (1) Incinerator
- (2) Electrostatic Precipitator
- (3) Catalytic Converter
- (4) STP

119. The flowers are Zygomorphic in:

- (a) Mustard
- (b) Gulmohar
- (c) Cassia
- (d) Datura
- (e) Chilly

Choose the **correct answer** from the options given below:

- (1) (b), (c) Only
- (2) (d), (e) Only
- (3) (c), (d), (e) Only
- (4) (a), (b), (c) Only

120. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A):

Polymerase chain reaction is used in DNA amplification

Reason (R):

The ampicillin resistant gene is used as a selectable marker to check transformation.

In the light of the above statements, choose the **correct** answer from the options given below:

- (1) Both **(A)** and **(R)** are correct but **(R)** is not the correct explanation of **(A)**
- (2) **(A)** is correct but **(R)** is not correct
- (3) **(A)** is not correct but **(R)** is correct
- (4) Both **(A)** and **(R)** are correct and **(R)** is the correct explanation of **(A)**

121. Which one of the following statements cannot be connected to Predation ?

- (1) It might lead to extinction of a species
- (2) Both the interacting species are negatively impacted
- (3) It is necessitated by nature to maintain the ecological balance
- (4) It helps in maintaining species diversity in a community

122. Which one of the following never occurs during mitotic cell division ?

- (1) Movement of centrioles towards opposite poles
- (2) Pairing of homologous chromosomes
- (3) Coiling and condensation of the chromatids
- (4) Spindle fibres attach to kinetochores of chromosomes

123. Which of the following is **not** a method of *ex situ* conservation ?

- (1) National Parks
- (2) Micropropagation
- (3) Cryopreservation
- (4) *In vitro* fertilization

124. Given below are two statements:

Statement I:

Mendel studied seven pairs of contrasting traits in pea plants and proposed the Laws of Inheritance

Statement II:

Seven characters examined by Mendel in his experiment on pea plants were seed shape and colour, flower colour, pod shape and colour, flower position and stem height

In the light of the above statements, choose the **correct** answer from the options given below:

- (1) Both **Statement I** and **Statement II** are incorrect
- (2) **Statement I** is correct but **Statement II** is incorrect
- (3) **Statement I** is incorrect but **Statement II** is correct
- (4) Both **Statement I** and **Statement II** are correct

125. Which one of the following plants does **not** show plasticity ?

- (1) Coriander
- (2) Buttercup
- (3) Maize
- (4) Cotton

126. What amount of energy is released from glucose during lactic acid fermentation?

- (1) More than 18%
- (2) About 10%
- (3) Less than 7%
- (4) Approximately 15%

127. The gaseous plant growth regulator is used in plants to :

- (1) promote root growth and root hair formation to increase the absorption surface
- (2) help overcome apical dominance
- (3) kill dicotyledonous weeds in the fields
- (4) speed up the malting process

128. Which of the following is **not** observed during apoplastic pathway ?

- (1) The movement does not involve crossing of cell membrane
- (2) The movement is aided by cytoplasmic streaming
- (3) Apoplastic is continuous and does not provide any barrier to water movement
- (4) Movement of water occurs through intercellular spaces and wall of the cells.

129. Which one of the following is **not true** regarding the release of energy during ATP synthesis through chemiosmosis? It involves :

- (1) Breakdown of electron gradient
- (2) Movement of protons across the membrane to the stroma
- (3) Reduction of NADP to NADPH₂ on the stroma side of the membrane
- (4) Breakdown of proton gradient

130. Which one of the following plants shows vexillary aestivation and diadelphous stamens ?

- (1) *Pisum sativum*
- (2) *Allium cepa*
- (3) *Solanum nigrum*
- (4) *Colchicum autumnale*

131. Given below are two statements:

Statement I:

Decomposition is a process in which the detritus is degraded into simpler substances by microbes.

Statement II:

Decomposition is faster if the detritus is rich in lignin and chitin

In the light of the above statements, choose the **correct answer** from the options given below:

- (1) Both **Statement I** and **Statement II** are incorrect
- (2) **Statement I** is correct but **Statement II** is incorrect
- (3) **Statement I** is incorrect but **Statement II** is correct
- (4) Both **Statement I** and **Statement II** are correct

132. Which one of the following produces nitrogen fixing nodules on the roots of *Alnus* ?

- (1) *Frankia*
- (2) *Rhodospirillum*
- (3) *Beijernickia*
- (4) *Rhizobium*

133. Exoskeleton of arthropods is composed of:

- (1) Cellulose
- (2) Chitin
- (3) Glucosamine
- (4) Cutin

134. XO type of sex determination can be found in:

- (1) Birds
- (2) Grasshoppers
- (3) Monkeys
- (4) *Drosophila*

135. In old trees the greater part of secondary xylem is dark brown and resistant to insect attack due to:

- (a) secretion of secondary metabolites and their deposition in the lumen of vessels.
- (b) deposition of organic compounds like tannins and resins in the central layers of stem.
- (c) deposition of suberin and aromatic substances in the outer layer of stem.
- (d) deposition of tannins, gum, resin and aromatic substances in the peripheral layers of stem.
- (e) presence of parenchyma cells, functionally active xylem elements and essential oils.

Choose the **correct answer** from the options given below:

- (1) (c) and (d) Only
- (2) (d) and (e) Only
- (3) (b) and (d) Only
- (4) (a) and (b) Only

Section-B (Biology : Botany)

136. Match **List-I** with **List-II**.

List-I	List-II
(a) Metacentric chromosome	(i) Centromere situated close to the end forming one extremely short and one very long arms
(b) Acrocentric chromosome	(ii) Centromere at the terminal end
(c) Sub-metacentric	(iii) Centromere in the middle forming two equal arms of chromosomes
(d) Telocentric chromosome	(iv) Centromere slightly away from the middle forming one shorter arm and one longer arm

Choose the **correct answer** from the options given below:

- (1) (a)-(i), (b)-(iii), (c)-(ii), (d)-(iv)
- (2) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)
- (3) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)
- (4) (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii)

137. The entire fleet of buses in Delhi were converted to CNG from diesel. In reference to this, which one of the following statements is **false** ?

- (1) The same diesel engine is used in CNG buses making the cost of conversion low
- (2) It is cheaper than diesel
- (3) It can not be adulterated like diesel
- (4) CNG burns more efficiently than diesel

138. Read the following statements on lipids and find out **correct** set of statements:

- (a) Lecithin found in the plasma membrane is a glycolipid
- (b) Saturated fatty acids possess one or more $c = c$ bonds
- (c) Gingely oil has lower melting point, hence remains as oil in winter
- (d) Lipids are generally insoluble in water but soluble in some organic solvents
- (e) When fatty acid is esterified with glycerol, monoglycerides are formed

Choose the **correct answer** from the options given below:

- (1) (a), (d) and (e) only
- (2) (c), (d) and (e) only
- (3) (a), (b) and (d) only
- (4) (a), (b) and (c) only

139. The anatomy of springwood shows some peculiar features. Identify the **correct** set of statements about springwood.

- (a) It is also called as the earlywood
- (b) In spring season cambium produces xylem elements with narrow vessels
- (c) It is lighter in colour
- (d) The springwood along with autumnwood shows alternate concentric rings forming annual rings
- (e) It has lower density

Choose the **correct answer** from the options given below:

- (1) (a),(c),(d) and (e) Only
- (2) (a), (b) and (d) Only
- (3) (c), (d) and (e) Only
- (4) (a),(b),(d) and (e) Only

140. Transposons can be used during which one of the following ?

- (1) Gene silencing
- (2) Autoradiography
- (3) Gene sequencing
- (4) Polymerase Chain Reaction

141. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A):

Mendel's law of Independent assortment does not hold good for the genes that are located closely on the same chromosome.

Reason (R):

Closely located genes assort independently.

In the light of the above statements, choose the **correct answer** from the options given below:

- (1) Both **(A)** and **(R)** are correct but **(R)** is not the correct explanation of **(A)**
- (2) **(A)** is correct but **(R)** is not correct
- (3) **(A)** is not correct but **(R)** is correct
- (4) Both **(A)** and **(R)** are correct and **(R)** is the correct explanation of **(A)**

142. In the following palindromic base sequences of DNA, which one can be cut easily by particular restriction enzyme ?

- (1) 5' G A A T T C 3'; 3' C T T A A G 5'
- (2) 5' C T C A G T 3'; 3' G A G T C A 5'
- (3) 5' G T A T T C 3'; 3' C A T A A G 5'
- (4) 5' G A T A C T 3'; 3' C T A T G A 5'

143. Which one of the following will accelerate phosphorus cycle ?

- (1) Volcanic activity
- (2) Weathering of rocks
- (3) Rain fall and storms
- (4) Burning of fossil fuels

- 144.** Match the plant with the kind of life cycle it exhibits:

List-I	List-II
(a) <i>Spirogyra</i>	(i) Dominant diploid sporophyte vascular plant, with highly reduced male or female gametophyte
(b) Fern	(ii) Dominant haploid free-living gametophyte
(c) <i>Funaria</i>	(iii) Dominant diploid sporophyte alternating with reduced gametophyte called prothallus
(d) <i>Cycas</i>	(iv) Dominant haploid leafy gametophyte alternating with partially dependent multicellular sporophyte

Choose the **correct answer** from the options given below:

- (1) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)
- (2) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)
- (3) (a)-(ii), (b)-(iv), (c)-(i), (d)-(iii)
- (4) (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)

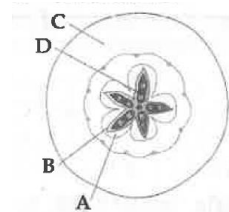
- 145.** While explaining interspecific interaction of population, (+) sign is assigned for beneficial interaction, (–) sign is assigned for detrimental interaction and (0) for neutral interaction. Which of the following interactions can be assigned (+) for one species and (–) for another species involved in the interaction ?

- (1) Amensalism
- (2) Commensalism
- (3) Competition
- (4) Predation

- 146.** Addition of more solutes in a given solution will :

- (1) lower its water potential
- (2) make its water potential zero
- (3) not affect the water potential at all
- (4) raise its water potential

- 147.** Which part of the fruit, labelled in the given figure makes it a false fruit ?



- (1) B → Endocarp
- (2) C → Thalamus
- (3) D → Seed
- (4) A → Mesocarp

- 148.** Which of the following occurs due to the presence of autosomal linked dominant trait ?

- (1) Myotonic dystrophy
- (2) Haemophilia
- (3) Thalassemia
- (4) Sickle cell anaemia

- 149.** If a geneticist uses the blind approach for sequencing the whole genome of an organism, followed by assignment of function to different segments, the methodology adopted by him is called as:

- (1) Gene mapping
- (2) Expressed sequence tags
- (3) Bioinformatics
- (4) Sequence annotation

- 150.** What is the role of large bundle sheath cells found around the vascular bundles in C_4 plants ?

- (1) To increase the number of chloroplast for the operation of Calvin cycle
- (2) To enable the plant to tolerate high temperature
- (3) To protect the vascular tissue from high light intensity
- (4) To provide the site for photorespiratory pathway

Section - A (Biology : Zoology)

151. Nitrogenous waste is excreted in the form of pellet or paste by :

- (1) *Salamandra* (2) *Hippocampus*
(3) *Pavo* (4) *Ornithorhynchus*

152. Select the **incorrect** statement with reference to mitosis:

- (1) Spindle fibres attach to centromere of chromosomes.
(2) Chromosomes decondense at telophase.
(3) Splitting of centromere occurs at anaphase.
(4) All the chromosomes lie at the equator at metaphase.

153. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A):

Osteoporosis is characterised by decreased bone mass and increased chances of fractures.

Reason (R):

Common cause of osteoporosis is increased levels of estrogen.

In the light of the above statements, choose the **most appropriate** answer from the options given below:

- (1) Both **(A)** and **(R)** are correct but **(R)** is not the correct explanation of **(A)**
(2) **(A)** is correct but **(R)** is not correct
(3) **(A)** is not correct but **(R)** is correct
(4) Both **(A)** and **(R)** are correct and **(R)** is the correct explanation of **(A)**

154. Under normal physiological conditions in human being every 100 ml of oxygenated blood can deliver _____ ml of O_2 to the tissues.

- (1) 5ml (2) 4 ml
(3) 10 ml (4) 2 ml

155. A dehydration reaction links two glucose molecules to produce maltose. If the formula for glucose is $C_6H_{12}O_6$ then what is the formula for maltose ?

- (1) $C_{12}H_{24}O_{12}$ (2) $C_{12}H_{22}O_{11}$
(3) $C_{12}H_{24}O_{11}$ (4) $C_{12}H_{20}O_{10}$

156. In which of the following animals, digestive tract has additional chambers like crop and gizzard ?

- (1) *Bufo*, *Balaenoptera*, *Bangarus*
(2) *Catla*, *Columba*, *Crocodilus*
(3) *Pavo*, *Psittacula*, *Corvus*
(4) *Corvus*, *Columba*, *Chameleon*

157. Given below are two statements:

Statement I:

The release of sperms into the seminiferous tubules is called spermiation.

Statement II:

Spermiogenesis is the process of formation of sperms from spermatogonia.

In the light of the above statements, choose the **most appropriate** answer from the options given below:

- (1) Both **Statement I** and **Statement II** are incorrect
(2) **Statement I** is correct but **Statement II** is incorrect
(3) **Statement I** is incorrect but **Statement II** is correct
(4) Both **Statement I** and **Statement II** are correct

158. Natural selection where more individuals acquire specific character value other than the mean character value, leads to:

- (1) Directional change
(2) Disruptive change
(3) Random change
(4) Stabilising change

- 159.** Which of the following statements with respect to Endoplasmic Reticulum is **incorrect**?
- (1) SER is devoid of ribosomes
 - (2) In prokaryotes only RER are present
 - (3) SER are the sites for lipid synthesis
 - (4) RER has ribosomes attached to ER
- 160.** Which of the following is present between the adjacent bones of the vertebral column?
- (1) Cartilage
 - (2) Areolar tissue
 - (3) Smooth muscle
 - (4) Intercalated discs
- 161.** Which of the following functions is **not** performed by secretions from salivary glands?
- (1) Digestion of complex carbohydrates
 - (2) Lubrication of oral cavity
 - (3) Digestion of disaccharides
 - (4) Control bacterial population in mouth
- 162.** In an *E.coli* strain *i* gene gets mutated and its product can not bind the inducer molecule. If growth medium is provided with lactose, what will be the outcome?
- (1) *z*, *y*, *a* genes will be transcribed
 - (2) *z*, *y*, *a* genes will not be translated
 - (3) RNA polymerase will bind the promoter region
 - (4) Only *z* gene will get transcribed
- 163.** Identify the asexual reproductive structure associated with *Penicillium*:
- (1) Conidia
 - (2) Gemmules
 - (3) Buds
 - (4) Zoospores
- 164.** If the length of a DNA molecule is 1.1 metres, what will be the approximate number of base pairs ?
- (1) 6.6×10^9 bp
 - (2) 3.3×10^6 bp
 - (3) 6.6×10^6 bp
 - (4) 3.3×10^9 bp
- 165.** Which of the following is **not** a connective tissue?
- (1) Adipose tissue
 - (2) Cartilage
 - (3) Neuroglia
 - (4) Blood
- 166.** Given below are two statements:
- Statement I:**
Restriction endonucleases recognise specific sequence to cut DNA known as palindromic nucleotide sequence.
- Statement II:**
Restriction endonucleases cut the DNA strand a little away from the centre of the palindromic site.
- In the light of the above statements, choose the **most appropriate** answer from the options given below:
- (1) Both **Statement I** and **Statement II** are incorrect
 - (2) **Statement I** is correct but **Statement II** is incorrect
 - (3) **Statement I** is incorrect but **Statement II** is correct
 - (4) Both **Statement I** and **Statement II** are correct
- 167.** Detritivores breakdown detritus into smaller particles. This process is called :
- (1) Fragmentation
 - (2) Humification
 - (3) Decomposition
 - (4) Catabolism
- 168.** Which of the following statements are true for spermatogenesis but **do not** hold true for Oogenesis?
- (a) It results in the formation of haploid gametes
 - (b) Differentiation of gamete occurs after the completion of meiosis
 - (c) Meiosis occurs continuously in a mitotically dividing stem cell population
 - (d) It is controlled by the Luteinising hormone (LH) and Follicle Stimulating Hormone (FSH) secreted by the anterior pituitary
 - (e) It is initiated at puberty
- Choose the **most appropriate** answer from the options given below:
- (1) (b) and (c) only
 - (2) (b), (d) and (e) only
 - (3) (b), (c) and (e) only
 - (4) (c) and (e) only

169. Given below are two statements:

Statement I:

Fatty acids and glycerols cannot be absorbed into the blood.

Statement II:

Specialized lymphatic capillaries called lacteals carry chylomicrons into lymphatic vessels and ultimately into the blood.

In the light of the above statements, choose the **most appropriate** answer from the options given below:

- (1) Both **Statement I** and **Statement II** are incorrect
- (2) **Statement I** is correct but **Statement II** is incorrect
- (3) **Statement I** is incorrect but **Statement II** is correct
- (4) Both **Statement I** and **Statement II** are correct

170. If '8' *Drosophila* in a laboratory population of '80' died during a week, the death rate in the population is _____ individuals per *Drosophila* per week.

- (1) 10
- (2) 1.0
- (3) zero
- (4) 0.1

171. Given below are two statements:

Statement I:

The coagulum is formed of network of threads called thrombins.

Statement II:

Spleen is the graveyard of erythrocytes.

In the light of the above statements, choose the **most appropriate** answer from the options given below:

- (1) Both **Statement I** and **Statement II** are incorrect
- (2) **Statement I** is correct but **Statement II** is incorrect
- (3) **Statement I** is incorrect but **Statement II** is correct
- (4) Both **Statement I** and **Statement II** are correct

172. Tegmina in cockroach, arises from:

- (1) Mesothorax
- (2) Metathorax
- (3) Prothorax and Mesothorax
- (4) Prothorax

173. In the taxonomic categories which hierarchical arrangement in ascending order is **correct** in case of animals ?

- (1) Kingdom, Class, Phylum, Family, Order, Genus, Species
- (2) Kingdom, Order, Class, Phylum, Family, Genus, Species
- (3) Kingdom, Order, Phylum, Class, Family, Genus, Species
- (4) Kingdom, Phylum, Class, Order, Family, Genus, Species

174. Identify the microorganism which is responsible for the production of an immunosuppressive molecule cyclosporin A:

- (1) *Clostridium butylicum*
- (2) *Aspergillus niger*
- (3) *Streptococcus cerevisiae*
- (4) *Trichoderma polysporum*

175. Which of the following is **not** the function of conducting part of respiratory system ?

- (1) Inhaled air is humidified
- (2) Temperature of inhaled air is brought to body temperature
- (3) Provides surface for diffusion of O₂ and CO₂
- (4) It clears inhaled air from foreign particles

176. Lippe's loop is a type of contraceptive used as :

- (1) Vault barrier
- (2) Non-Medicated IUD
- (3) Copper releasing IUD
- (4) Cervical barrier

- 177.** Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) :

All vertebrates are chordates but all chordates are not vertebrates.

Reason (R) :

Notochord is replaced by vertebral column in the adult vertebrates.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

- (1) Both **(A)** and **(R)** are correct but **(R)** is **not** the correct explanation of **(A)**
- (2) **(A)** is correct but **(R)** is not correct
- (3) **(A)** is not correct but **(R)** is correct
- (4) Both **(A)** and **(R)** are correct and **(R)** is the correct explanation of **(A)**

- 178.** Given below are two statements :

Statement I:

Mycoplasma can pass through less than 1 micron filter size.

Statement II:

Mycoplasma are bacteria with cell wall

In the light of the above statements, choose the **most appropriate** answer from the options given below:

- (1) Both **Statement I** and **Statement II** are incorrect
- (2) **Statement I** is correct but **Statement II** is incorrect
- (3) **Statement I** is incorrect but **Statement II** is correct
- (4) Both **Statement I** and **Statement II** are correct

- 179.** Regarding Meiosis, which of the statements is **incorrect** ?

- (1) DNA replication occurs in S phase of Meiosis-II
- (2) Pairing of homologous chromosomes and recombination occurs in Meiosis-I
- (3) Four haploid cells are formed at the end of Meiosis-II
- (4) There are two stages in Meiosis, Meiosis-I and II

- 180.** *In-situ* conservation refers to:

- (1) Conserve only high risk species
- (2) Conserve only endangered species
- (3) Conserve only extinct species
- (4) Protect and conserve the whole ecosystem

- 181.** At which stage of life the oogenesis process is initiated ?

- (1) Embryonic development stage
- (2) Birth
- (3) Adult
- (4) Puberty

- 182.** Which of the following is a **correct** match for disease and its symptoms ?

- (1) Tetany - high Ca^{2+} level causing rapid spasms.
- (2) Myasthenia gravis - Genetic disorder resulting in weakening and paralysis of skeletal muscle
- (3) Muscular dystrophy - An auto immune disorder causing progressive degeneration of skeletal muscle
- (4) Arthritis - Inflamed joints

- 183.** Given below are two statements:

Statement I:

Autoimmune disorder is a condition where body defense mechanism recognizes its own cells as foreign bodies.

Statement II:

Rheumatoid arthritis is a condition where body does not attack self cells.

In the light of the above statements, choose the **most appropriate** answer from the options given below:

- (1) Both **Statement I** and **Statement II** are incorrect
- (2) **Statement I** is correct but **Statement II** is incorrect
- (3) **Statement I** is incorrect but **Statement II** is correct
- (4) Both **Statement I** and **Statement II** are correct

184. In gene therapy of Adenosine Deaminase (ADA) deficiency, the patient requires periodic infusion of genetically engineered lymphocytes because:

- (1) Gene isolated from marrow cells producing ADA is introduced into cells at embryonic stages
- (2) Lymphocytes from patient's blood are grown in culture, outside the body.
- (3) Genetically engineered lymphocytes are not immortal cells.
- (4) Retroviral vector is introduced into these lymphocytes.

185. Breeding crops with higher levels of vitamins and minerals or higher proteins and healthier fats is called:

- (1) Bio-remediation
- (2) Bio-fortification
- (3) Bio-accumulation
- (4) Bio-magnification

Section - B (Biology : Zoology)

186. Which one of the following statements is **correct**?

- (1) The tricuspid and the bicuspid valves open due to the pressure exerted by the simultaneous contraction of the atria
- (2) Blood moves freely from atrium to the ventricle during joint diastole.
- (3) Increased ventricular pressure causes closing of the semilunar valves.
- (4) The atrio-ventricular node (AVN) generates an action potential to stimulate atrial contraction

187. Select the **incorrect** statement regarding synapses:

- (1) Electrical current can flow directly from one neuron into the other across the electrical synapse.
- (2) Chemical synapses use neurotransmitters
- (3) Impulse transmission across a chemical synapse is always faster than that across an electrical synapse.
- (4) The membranes of presynaptic and postsynaptic neurons are in close proximity in an electrical synapse.

188. Select the **incorrect** statement with respect to acquired immunity.

- (1) Anamnestic response is elicited on subsequent encounters with the same pathogen.
- (2) Anamnestic response is due to memory of first encounter.
- (3) Acquired immunity is non-specific type of defense present at the time of birth.
- (4) Primary response is produced when our body encounters a pathogen for the first time.

189. Match **List -I** with **List -II**.

List-I (Biological Molecules)	List-II (Biological functions)
(a) Glycogen	(i) Hormone
(b) Globulin	(ii) Biocatalyst
(c) Steroids	(iii) Antibody
(d) Thrombin	(iv) Storage product

Choose the **correct answer** from the options given below:

- (1) (a)-(iv), (b)-(ii), (c)-(i), (d)-(iii)
- (2) (a)-(ii), (b)-(iv), (c)-(iii), (d)-(i)
- (3) (a)-(iv), (b)-(iii), (c)-(i), (d)-(ii)
- (4) (a)-(iii), (b)-(ii), (c)-(iv), (d)-(i)

190. Match **List -I** with **List -II** with respect to methods of Contraception and their respective actions.

List-I	List-II
(a) Diaphragms	(i) Inhibit ovulation and Implantation
(b) Contraceptive Pills	(ii) Increase phagocytosis of sperm within Uterus
(c) Intra uterine Devices	(iii) Absence of Menstrual cycle and ovulation following parturition
(d) Lactational Amenorrhea	(iv) They cover the cervix blocking the entry of sperms

Choose the **correct answer** from the options given below:

- (1) (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)
- (2) (a)-(ii), (b)-(iv), (c)-(i), (d)-(iii)
- (3) (a)-(iii), (b)-(ii), (c)-(i), (d)-(iv)
- (4) (a)-(iv), (b)-(i), (c)-(iii), (d)-(ii)

191. Ten *E.coli* cells with ^{15}N - dsDNA are incubated in medium containing ^{14}N nucleotide. After 60 minutes, how many *E.coli* cells will have DNA totally free from ^{15}N ?

- (1) 40 cells
- (2) 60 cells
- (3) 80 cells
- (4) 20 cells

192. The recombination frequency between the genes a & c is 5%, b & c is 15%, b & d is 9%, a & b is 20%, c & d is 24% and a & d is 29%. What will be the sequence of these genes on a linear chromosome ?

- (1) d, b, a, c
- (2) a, b, c, d
- (3) a, c, b, d
- (4) a, d, b, c

193. Given below are two statements:

Statement I:

In a scrubber the exhaust from the thermal plant is passed through the electric wires to charge the dust particles.

Statement II:

Particulate matter (PM 2.5) can not be removed by scrubber but can be removed by an electrostatic precipitator.

In the light of the above statements, choose the **most appropriate** answer from the options given below:

- (1) Both **Statement I** and **Statement II** are incorrect
- (2) **Statement I** is correct but **Statement II** is incorrect
- (3) **Statement I** is incorrect but **Statement II** is correct
- (4) Both **Statement I** and **Statement II** are correct

194. Statements related to human Insulin are given below.

Which statement(s) is/ are **correct** about genetically engineered Insulin ?

- (a) Pro-hormone insulin contain extra stretch of C-peptide
- (b) A-peptide and B-peptide chains of insulin were produced separately in *E.coli*, extracted and combined by creating disulphide bond between them.
- (c) Insulin used for treating Diabetes was extracted from Cattles and Pigs.
- (d) Pro-hormone Insulin needs to be processed for converting into a mature and functional hormone.
- (e) Some patients develop allergic reactions to the foreign insulin.

Choose the **most appropriate** answer from the options given below:

- (1) (b) only
- (2) (c) and (d) only
- (3) (c), (d) and (e) only
- (4) (a), (b) and (d) only

195. Which of the following statements is **not** true ?

- (1) Sweet potato and potato is an example of analogy
- (2) Homology indicates common ancestry
- (3) Flippers of penguins and dolphins are a pair of homologous organs
- (4) Analogous structures are a result of convergent evolution

196. Which of the following is **not** a desirable feature of a cloning vector ?

- (1) Presence of a marker gene
- (2) Presence of single restriction enzyme site
- (3) Presence of two or more recognition sites
- (4) Presence of origin of replication

197. Match **List -I** with **List - II**.

List-I	List-II
(a) Bronchioles	(i) Dense Regular Connective Tissue
(b) Goblet cell	(ii) Loose Connective Tissue
(c) Tendons	(iii) Glandular Tissue
(d) Adipose Tissue	(iv) Ciliated Epithelium

Choose the **correct answer** from the options given below:

- (1) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)
- (2) (a)-(ii), (b)-(i), (c)-(iv), (d)-(iii)
- (3) (a)-(iii), (b)-(iv), (c)-(ii), (d)-(i)
- (4) (a)-(iv), (b)-(iii), (c)-(i), (d)-(ii)

198. Which of the following is a **correct** statement ?

- (1) Bacteria are exclusively heterotrophic organisms.
- (2) Slime moulds are saprophytic organisms classified under Kingdom Monera.
- (3) Mycoplasma have DNA, Ribosome and cell wall
- (4) Cyanobacteria are a group of autotrophic organisms classified under Kingdom Monera.

199. Which of the following are not the effects of Parathyroid hormone ?

- (a) Stimulates the process of bone resorption
- (b) Decreases Ca^{2+} level in blood
- (c) Reabsorption of Ca^{2+} by renal tubules
- (d) Decreases the absorption of Ca^{2+} from digested food
- (e) Increases metabolism of carbohydrates

Choose the **most appropriate** answer from the options given below:

- (1) (b), (d) and (e) only
- (2) (a) and (e) only
- (3) (b) and (c) only
- (4) (a) and (c) only

200. If a colour blind female marries a man whose mother was also colour blind, what are the chances of her progeny having colour blindness ?

- | | |
|----------|---------|
| (1) 50% | (2) 75% |
| (3) 100% | (4) 25% |

ANSWER KEY

NEET(UG)-2022

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	1	1	3	1	2	1	1	2	1	3	2	4	4	3	1
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	3	1	2	B	2	1	3	3	3	2	2	2	2	4	1
Que.	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Ans.	2	2	3	2	2	3	3	2	1	4	2	1	1	2	1
Que.	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ans.	1	2	2	1	2	2	3	2	4	1	4	4	3	3	1
Que.	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Ans.	1	3	4	4	4	3	3	2	2	1	2	1	3	4	3
Que.	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
Ans.	3	1	1	1	2	2	3	4	3	2	1	4	4	1	2
Que.	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105
Ans.	4	1	4	3	2	1	B	4	4	3	1	2	2	1	4
Que.	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
Ans.	3	2	2	2	2	4	2	1	1	2	1	4	2	1	1
Que.	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135
Ans.	2	2	1	4	3	3	1	2	1	1	2	1	2	2	4
Que.	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
Ans.	4	1	2	1	1	2	1	2	1	4	1	2	1	4	1
Que.	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165
Ans.	3	1	2	1	2	3	2	1	2	1	3	2	1	4	3
Que.	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
Ans.	4	1	3	4	4	3	1	4	4	3	2	4	2	1	4
Que.	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195
Ans.	1	4	2	3	2	2	3	3	3	1	2	3	3	1	3
Que.	196	197	198	199	200										
Ans.	3	4	4	1	3										

HINT - SHEET

1. $V = \frac{1}{4\pi\epsilon_0} \cdot \frac{Q}{R}$

$$\frac{1}{4\pi\epsilon_0} = \text{constant}$$

Q = same (Given)

$$\therefore V \propto \frac{1}{R}$$

\therefore Potential is more on smaller sphere.

2. $\omega = \omega_0 + \alpha t$

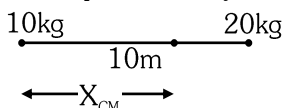
$$\alpha = \frac{\omega - \omega_0}{t}$$

$$= \frac{(3120 - 1200)}{16\text{s}} \text{rpm}$$

$$= \frac{1920}{16} \times \frac{2\pi}{60} \text{rad/s}^2$$

$$= 4\pi \text{ rad/s}^2$$

3. In (a) & (c) circuits, both the junctions are in same biasing conditions so offers equal resistances. Since both are in series, therefore equal potential will drop across the junction.

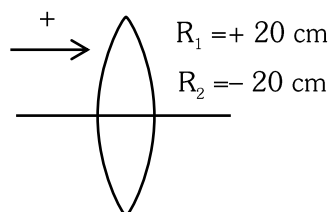
4. 

$$X_{CM} = \frac{20 \times 10}{20 + 10} = \frac{20}{3} \text{m}$$

5. $R_1 = R_2 = 20 \text{ cm} = 0.2 \text{ m}$

$$\mu = \frac{3}{2}$$

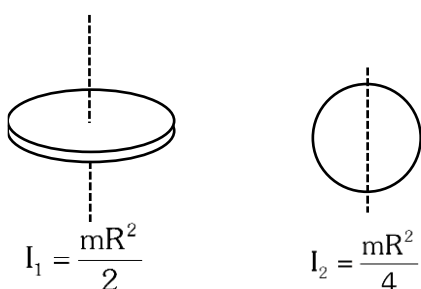
$$P = \frac{1}{f} = (\mu - 1) \left(\frac{1}{R_1} - \frac{1}{R_2} \right)$$



$$P = \left(\frac{3}{2} - 1 \right) \left(\frac{1}{0.2} + \frac{1}{0.2} \right)$$

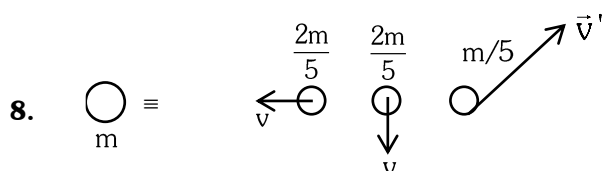
$$P = \frac{1}{2} \left(\frac{2}{0.2} \right) = \frac{10}{2} = +5D$$

6. Initially speed is zero, then increases & after some time it becomes constant.
Acceleration (slope of v/t curve) of ball first decreases and after some time it becomes zero.



$$k = \sqrt{\frac{I}{m}}$$

$$\Rightarrow \frac{k_1}{k_2} = \sqrt{\frac{I_1}{I_2}} = \sqrt{\frac{mR^2/2}{mR^2/4}} = \sqrt{2} : 1$$



By conservation of momentum :

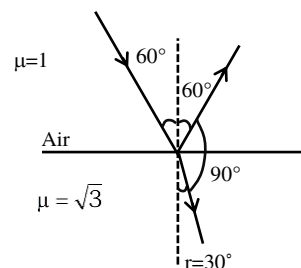
$$m(0) = \frac{2m}{5}(-v\hat{i}) + \frac{2m}{5}(-v\hat{j}) + \frac{m}{5}\vec{v}'$$

$$\Rightarrow \vec{v}' = 2v\hat{i} + 2v\hat{j}$$

$$\Rightarrow v' = \sqrt{(2v)^2 + (2v)^2} = 2\sqrt{2}v$$

9. $B = \mu_0 ni = \mu_0 \frac{N}{\ell} i$
 $\therefore B = 4\pi \times 10^{-7} \times \frac{100}{10^{-3}} \times 1 = 12.56 \times 10^{-2} T$

10. First excited state $\Rightarrow n = 2$
 $T_1 = -13.6 \frac{z^2}{n^2} = -\frac{13.6}{4} eV$
Second excited state $\Rightarrow n = 3$
 $T_2 = -13.6 \frac{z^2}{n^2} = -\frac{13.6}{9} eV$
 $T_1 : T_2 = \frac{1}{4} : \frac{1}{9} = 9 : 4$



11.

Method (i)

By Snell's law

$$1 \sin 60^\circ = \sqrt{3} \sin r$$

$$\frac{\sqrt{3}}{2} = \sqrt{3} \sin r$$

$$\sin r = \frac{1}{2}$$

$$r = 30^\circ$$

Angle between refracted and reflected ray is 90°

Method (ii)

Because angle of incidence is Brewster's angle so that angle between reflected and refracted ray is 90°

$$\tan i_p = \mu = \sqrt{3}$$

$$i_p = 60^\circ = i$$

12. $P = P_0 + \frac{4T}{R}$

$\Rightarrow R$ increases and P decreases

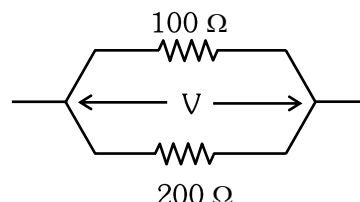
13. Plane angle and solid angle are dimensionless but have units.

14. $n = \sqrt{\epsilon_r \mu_r}$

$$n = \frac{c}{v} \Rightarrow v = \frac{c}{n}$$

$$v = \left(\frac{c}{\sqrt{\epsilon_r \mu_r}} \right)$$

15.



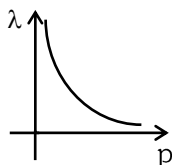
As both resistors are in parallel combination so potential drop (V) across both are same.

$$P = \frac{V^2}{R} \Rightarrow P \propto \frac{1}{R}$$

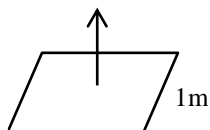
$$\frac{P_1}{P_2} = \frac{R_2}{R_1} = \frac{200}{100} = \frac{2}{1} = 2 : 1$$

16. $\lambda = \frac{h}{p}$

Graph will be hyperbolic



17. $B = 0.5 \text{ T}$



Angle between \vec{B} & \vec{A} is zero

$$\begin{aligned}\phi &= B.A. \cos 0 \\ &= 0.5 \times (1) \times 1 \\ &= 0.5 \text{ Wb}\end{aligned}$$

18. $[\text{MLT}^{-2}\text{A}^{-2}] = \text{Magnetic permeability}$

19. Using the equation

$$eV = h\nu - \phi$$

$$\text{or } eV = h\nu - h\nu_{\text{Th}}$$

$$\frac{eV_s}{2} = \frac{h\nu}{2} - h\nu_{\text{Th}} \quad \dots (1)$$

$$eV_s = h\nu - h\nu_{\text{Th}} \quad \dots (2)$$

Data Incorrect

20. In half wave rectification

$$f_{\text{in}} = f_{\text{out}}$$

$$\Rightarrow f_{\text{out}} = 60 \text{ Hz}$$

21. 1 : Isochoric

2 : Adiabatic

3 : Isothermal

4 : Isobaric

22. (a) Radio wave (ii) $\approx 10^2 \text{ m}$ (ii)

(b) Microwave \approx (iii) 10^{-2} m (iii)

(c) Infrared radiations \approx (iv) 10^{-4} m (iv)

(d) X-ray (i) $\approx \text{\AA} = 10^{-10} \text{ m}$ (i)

(a) – (ii), (b) – (iii), (c) – (iv), (d) – (i)

23. Velocity is slope of $x-t$ graph

$$V = \frac{dx}{dt} = \tan \theta$$

$$\frac{V_1}{V_2} = \frac{\tan \theta_1}{\tan \theta_2} = \frac{\tan 30^\circ}{\tan 45^\circ} = \frac{1}{\sqrt{3}}$$

24. $y = (n\lambda) \left(\frac{D}{d} \right)$

$$n_1 \lambda_1 = n_2 \lambda_2$$

$$(8) (600 \text{ nm}) = n_2 (400)$$

$$n_2 = 12$$

25. Peak voltage is $\sqrt{2}$ times rms voltages in ac.

26. $v \propto \sqrt{\text{Tension}}$

$$\frac{v_i}{v_f} = \sqrt{\frac{T_i}{T_f}}$$

$$\frac{v_i}{v_f} = \sqrt{\frac{T}{2T}}$$

$$\frac{v_i}{v_f} = \sqrt{\frac{1}{2}} = \frac{1}{\sqrt{2}}$$

27.
$$d\vec{B} = \frac{\mu_0 \left(Id \vec{\ell} \times \vec{r} \right)}{4\pi r^3}$$

As per Biot Savart law, the expression for magnetic field depends on current carrying

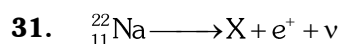
element $Id\vec{\ell}$, which is a vector quantity, therefore, statement-I is correct and statement-II is wrong.

28. For conductors α is (+)ve

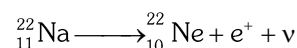
For semiconductors & Insulators α is (-)ve

29. $E = P \times t = 100 \times 10^3 \times 3600$
 $= 36 \times 10^7 \text{ J}$

30. $I_g = \frac{F}{m} = \frac{3}{60 \times 10^{-3}} = 50 \text{ N/kg}$



This is β^+ – decay



32. Electric field is always perpendicular to EPS.

33. Radius of wire $= \frac{10^{-2}}{\sqrt{\pi}}$

$$\text{Cross sectional area } A = \pi r^2 = 10^{-4} \text{ m}^2$$

$$j = \frac{i}{A} = \left(\frac{V}{R} \right) \cdot \frac{1}{A} = \frac{E\ell}{RA} \quad R = \frac{\rho\ell}{A}$$

$$j = \frac{10 \times 10}{10 \times 10^{-4}} = 10^5 \text{ A/m}^2$$

or

$$J = \sigma E \Rightarrow \frac{E}{\rho} = \frac{E\ell}{RA} = \frac{10 \times 10 \times \pi}{10 \times 10^{-4} \times \pi}$$

$$\Rightarrow 10^5 \text{ A/m}^2$$

34. $S_{nth} = u + \frac{a}{2}(2n-1)$

$$= 0 + \frac{a}{2}(2n-1)$$

$$S_{nth} \propto (2n-1)$$

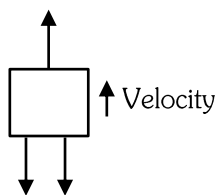
$$\Rightarrow S_{1st}, S_{2nd}, S_{3rd}, S_{4th}$$

$$= [2(1)-1] : [2(2)-1] : [2(3)-1] : [2(4)-1]$$

$$= 1 : 3 : 5 : 7$$

35. Constant velocity $\Rightarrow a = 0$

$$\begin{aligned} \Rightarrow T &= W + f \\ &= 20000 + 3000 \\ &= 23000 \text{ N} \end{aligned}$$



$$\begin{aligned} \Rightarrow \text{Power} &= Tv \\ &= 23000 \times 1.5 \\ &= 34500 \text{ watts} \end{aligned}$$

36. $V = (\text{no. of moles}) (22.4 \text{ litre})$

$$= \frac{\text{mass}}{\text{molar mass}} (22.4 \times 10^{-3} \text{ m}^3)$$

$$= \frac{4.5 \times 10^3}{18} \times 22.4 \times 10^{-3} \text{ m}^3$$

$$= 5.6 \text{ m}^3$$

37. Area = Length \times Breadth

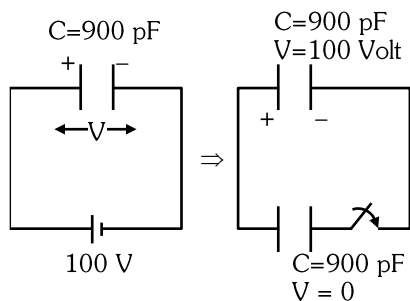
$$= 55.3 \times 25$$

$$= 1382.5$$

$$= 14 \times 10^2$$

Resultant should have 2 significant figures.

38.



Common potential

$$\begin{aligned} V_c &= \frac{C_1 V_1 + C_2 V_2}{C_1 + C_2} \\ &= \frac{C \times 100 + C \times 0}{C + C} \\ &= 50 \text{ Volt} \end{aligned}$$

Electrostatic energy stored

$$= 2 \times \frac{1}{2} CV^2 = CV^2$$

$$= 900 \times 10^{-12} \times 50 \times 50$$

$$= 225 \times 10^{-8} \text{ J}$$

$$= 2.25 \times 10^{-6} \text{ J}$$

39. Gravitational constant = $[M^{-1}L^3T^{-2}]$

Gravitational potential energy = $[ML^2T^{-2}]$

Gravitational potential = $[L^2T^{-2}]$

Gravitational intensity = $[LT^{-2}]$

40. $(n)T_\ell = (n+1)T_s$

$$(n)2\pi\sqrt{\frac{1.21}{g}} = (n+1)2\pi\sqrt{\frac{1}{g}}$$

$$(n)(1.1) = (n+1)$$

$$0.1(n) = 1$$

$$n = 10$$

No. of oscillation of smaller one

$$= n + 1$$

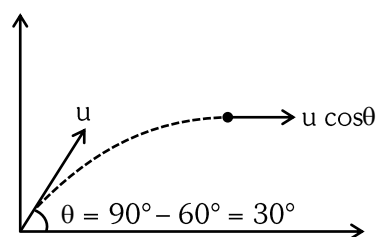
$$= 10 + 1$$

$$= 11$$

41. In stretching of a spring shape charges therefore shear modulus is used.

$$Y_{\text{copper}} < Y_{\text{steel}}$$

42. At highest point only horizontal component of velocity remains $\Rightarrow u_x = u \cos \theta$



$$\begin{aligned} u_x &= u \cos \theta = 10 \cos 30^\circ \\ &= 5\sqrt{3} \text{ ms}^{-1} \end{aligned}$$

43.

$$\mu = \frac{C}{u} \Rightarrow u \propto \frac{1}{\mu}$$

$$\sin i_c = \frac{\mu_R}{\mu_D} = \frac{u_D}{u_R}$$

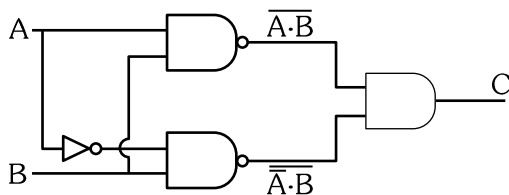
Critical angle

$$\sin i_c = \frac{\mu_R}{\mu_D} = \frac{u_D}{u_R} = \frac{1.5}{2} = \frac{3}{4}$$

$$i_c = \sin^{-1}\left(\frac{3}{4}\right)$$

$$i_c = \sin^{-1}\left(\frac{3}{4}\right)$$

44.



$$C = \overline{A \cdot B} \cdot \overline{\overline{A} \cdot \overline{B}}$$

using De-Morgan Theorem

$$C = \overline{A \cdot B + \overline{A} \cdot \overline{B}}$$

$$C = \overline{B(A + \overline{A})} = \overline{B}$$

Therefore

A	B	C
0	0	1
0	1	0
1	0	1
1	1	0

45. $\omega = 100$

$$v = \frac{\omega}{2\pi} = \frac{100}{2\pi} = \frac{50}{\pi} \text{ Hz}$$

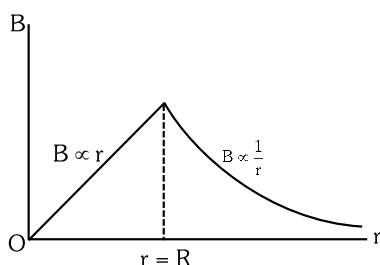
Resonance frequency

$$v_0 = \frac{1}{2\pi\sqrt{LC}} = \frac{1}{2\pi\sqrt{10 \times 10 \times 10^{-6}}}$$

$$= \frac{50}{\pi} \text{ Hz}$$

46. Resistance of P & Q should be approx. equal as it decreases error in experiment.

47.



48.

$$i_{\max} = \frac{E_{\max}}{R} = \frac{NBA\omega}{R}$$

$$i_{\max} = \frac{1000 \times 2 \times 10^{-5} \times \pi(10^2) \times 2}{12.56}$$

$$i_{\max} = 1 \text{ A}$$

49. It is electric dipole at large distance electric field intensity

$$E = \frac{KP}{R^3} \sqrt{1 + 3\cos^2 \theta}$$

$$\therefore E \propto \frac{1}{R^3}$$

50. Nuclear Radius :

$$R = R_0(A)^{1/3}$$

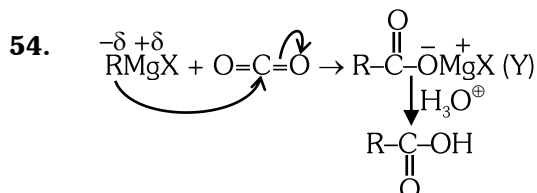
$$\frac{R(125)}{R(64)} = \frac{R_0(125)^{1/3}}{R_0(64)^{1/3}} = \frac{5}{4}$$

51. According to Hardy Schulze Rule statement 1 is correct. (Generally, the greater the valence of the flocculating ion added, the greater is its power to cause precipitation)

According to Hardy Schulze Rule statement 2 is incorrect

52. Thermosetting polymers are NOT reusable.

53. Enantiomers are non-superimposable mirror images of each other.



55. $m = \frac{\text{Moles of solute}}{\text{Weight of solvent (g)}} \times 1000$

$$1 = \frac{0.5}{\text{Weight of solvent (g)}} \times 1000$$

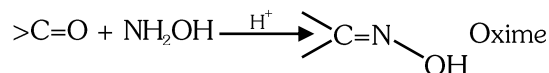
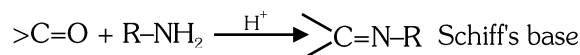
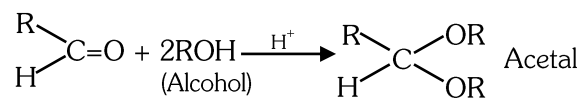
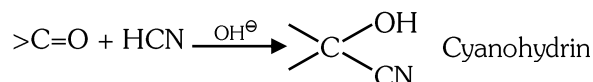
$$\text{Weight of solvent (g)} = 500 \text{ g}$$

56. Electron deficient hydride \rightarrow Less than $8e^-$ (B_2H_6)Electron precise hydride \rightarrow having $8e^-$ without l.p. (GeH_4)Electron rich hydride \rightarrow having $8e^-$ with l.p. (HF)

57. Boiling point of comparable molecular mass molecules

 $\text{R}-\text{OH} > \text{Aldehyde} - \text{Ketone} > \text{Alkane}$ H-bonding Dipole-dipole interaction Non-polar
(strong molecular association) (weak molecular association)

58.



59. Dalton's law of partial pressure :

Partial pressure of gas = mole fraction of gas in gaseous mixture \times Total pressure of gaseous mixture.

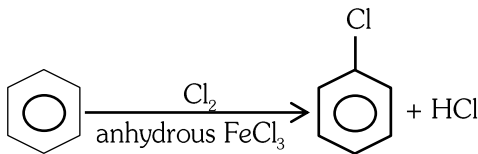
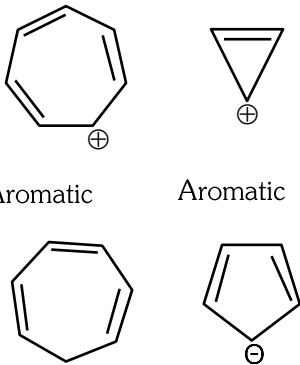
$$p_1 = X_1 p$$

$$p_2 = X_2 p$$

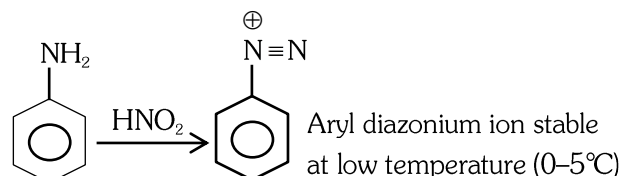
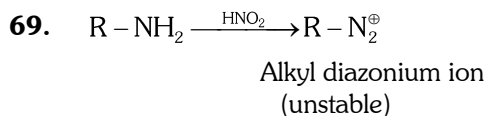
$$p_3 = X_3 p$$

$$\text{Total pressure, } p = p_1 + p_2 + p_3$$

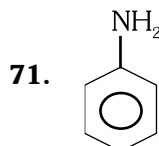
Therefore, statement-3 is incorrect.

60. Antacid – Cimetidine
Antihistamine – Seldane
Analgesic – Morphine
Antimicrobials - Salvarsan
61. Hydrides of group 16th
 H_2O H_2S H_2Se H_2Te
 H-bond VWA \propto mol.wt.
 B.P. $\rightarrow \text{H}_2\text{S} < \text{H}_2\text{Se} < \text{H}_2\text{Te} < \text{H}_2\text{O}$
62. IUPAC
 $[\text{Ag}(\text{H}_2\text{O})_2] [\text{Ag}(\text{CN})_2]$
 Coordination number = 2,
 Oxidation state = Ag^{+1}
 Diaquasilver(I) dicyanidoargentate(I)
63. 
64. Interhalogen compound group 17th
 ICl is more reactive due to polar bonds.
 From NCERT - X-X' bond is weaker than X-X bond except F_2
65. IUPAC nomenclature
 119 \rightarrow Ununennium \rightarrow Uue
66. SRP : $E^\circ_{\text{Zn}^{2+}/\text{Zn}} < E^\circ_{\text{Fe}^{2+}/\text{Fe}} < E^\circ_{\text{Cu}^{2+}/\text{Cu}} < E^\circ_{\text{Ag}^+/\text{Ag}}$
 Reactivity order : $\text{Zn} > \text{Fe} > \text{Cu} > \text{Ag}$
 In case of displacement reaction, more reactive metals (lower SRP) can displace less reactive metals (higher SRP) from their salt solution.
 $\text{CuSO}_4(\text{aq.}) + 2\text{Ag}(\text{s}) \rightarrow \text{Cu}(\text{s}) + \text{Ag}_2\text{SO}_4(\text{aq.})$
 Option (3)
 Reaction is not possible
 as Ag is less reactive metal compare to Cu.
67. 
 Aromatic Aromatic
 Non-Aromatic Aromatic
68. In diamond each carbon is bonded with four other carbon atoms. So hybridisation of carbon atom is sp^3 .

In graphite each carbon is bonded with three other carbon atoms. So hybridisation of carbon atom is sp^2 .

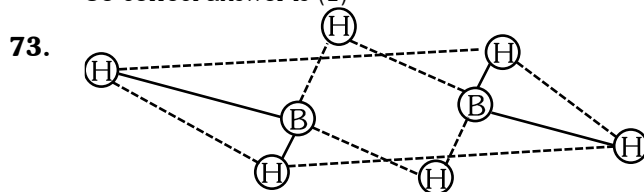


70. (i) Statement-1 is correct because in point defects of ionic solid electrical neutrality is essential condition (given question is example of metal deficiency defect)
 (ii) Statement-2 is correct because In Frenkel defect cation dislocate from lattice site to interstitial position.
 (iii) Both statement are correct but statement-2 is not correct explanation of statement-1



Kjeldahl's method is not applicable to the compounds containing nitrogen having nitro and azo group and nitrogen present in the ring (pyridine), as nitrogen of these compounds does not change to ammonium sulphate under these conditions.

72. In P-V graph area under the curve represent magnitude of work.
 As it is maximum in graph-1
 So correct answer is (1)



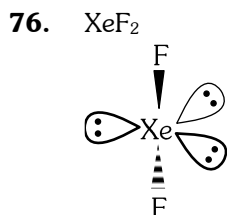
B has sp^3 Hybridisation
 Non-planar

74. Weak acid (CH_3COOH) and salt of weak acid-strong base (CH_3COONa) form an acidic buffer.
 Sodium acetate (CH_3COONa) = 0.10 M;
 Acetic acid (CH_3COOH) = 0.01 M;
 pH of acidic buffer solution is given by

$$\text{pH} = \text{pK}_a + \log \frac{[\text{Salt}]}{[\text{Acid}]}$$

$$= 4.57 + \log \left(\frac{0.1}{0.01} \right) = 5.57$$

75. O_2^+ ion is having 15 electrons, so it contains one unpaired electron. Hence it is paramagnetic in nature.



XeF_2 has maximum 3 lone-pair – lone-pair repulsions

77. $CaCO_{3(s)} + 2HCl_{(aq)} \rightarrow CaCl_{2(aq)} + CO_{2(g)} + H_2O_{(l)}$

$$\text{no. of moles of } CaCO_3 (\text{pure}) = \frac{1}{2} \times \text{mole of } HCl$$

$$[\text{Mole} = \text{molarity} \times \text{volume (in ltr.)}]$$

$$= \frac{1}{2} \times 0.5 \times \frac{50}{1000} = 0.0125$$

$$\text{weight of } CaCO_3 (\text{pure}) = \text{mole} \times \text{mol. wt.}$$

$$= 0.0125 \times 100 = 1.25 \text{ g}$$

$$\% \text{ purity} = \frac{\text{wt. of pure substance}}{\text{wt. of impure sample}} \times 100$$

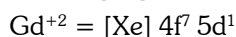
$$95 = \frac{1.25}{\text{wt. of impure sample}} \times 100$$

$$\text{wt. of impure sample} = \frac{1.25 \times 100}{95} = 1.32 \text{ g}$$

78. KO_2

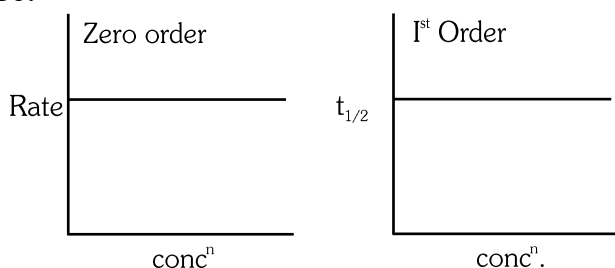
$K^+ O_2^-$ (O_2^- – superoxide ion)

79. ${}_{64}Gd = [Xe] 6s^2 4f^7 5d^1$



After losing 5d electron 4f has maximum exchange energy so Gd has low value of Third Ionisation energy

- 80.

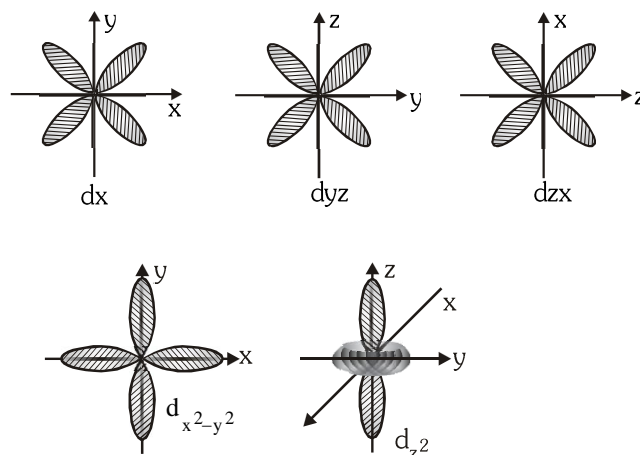


(I) curve is suitable for zero order if $y = \text{rate}$ and $x = \text{concentration}$ because in case of zero order reaction rate is constant and does not depend on conc^n .

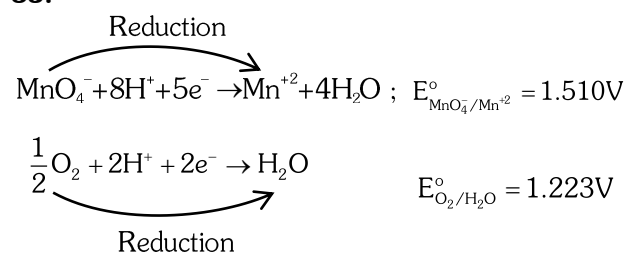
(II) curve is suitable for first order if $y = t_{1/2}$ and $x = \text{conc}^n$ because in case of first order $t_{1/2}$ does not depend on conc^n .

81. Which is incorrect statement regarding enzymes
- (1) Like chemical catalysts enzymes reduce the activation energy of bio process \Rightarrow This is correct statement.
 - (2) Enzymes are polysaccharides \Rightarrow This is incorrect statement because enzymes are protein in nature
 - (3) Enzymes are very specific for a particular reaction and substrate \Rightarrow This is correct statement.
 - (4) Enzymes are biocatalyst \Rightarrow This is correct statement.

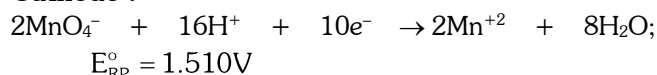
- 82.



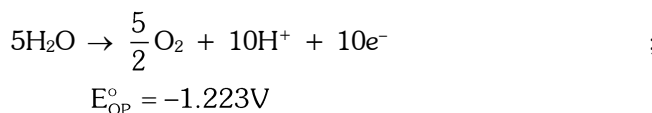
- 83.



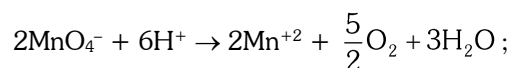
Cathode :



Anode :



Target reaction :



$$E_{\text{cell}}^\circ = (\text{SRP})_{\text{Cathode}} - (\text{SRP})_{\text{Anode}}$$

$$E_{\text{Cell}}^\circ = 1.510\text{V} - 1.223\text{V}$$

$$= 0.287\text{V}$$

Yes the given cell reaction is possible.

- 84.

Li - Electrochemical cells

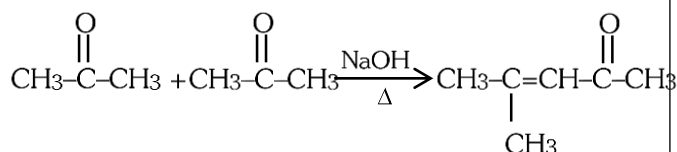
Na - Coolant in fast breeder reactors

KOH - absorbent for CO_2

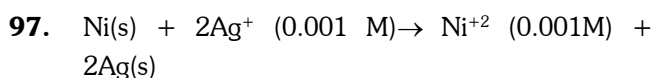
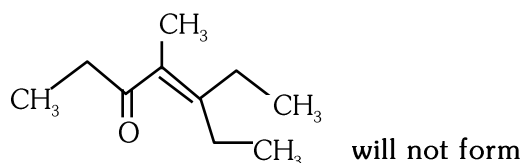
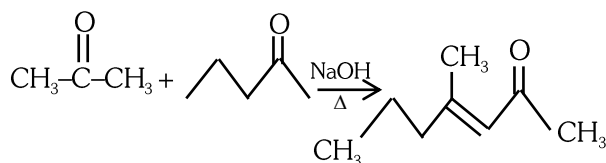
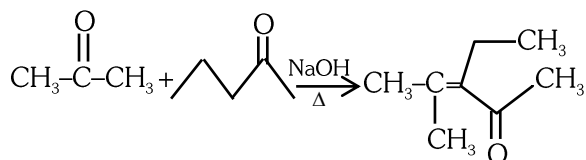
Cs - Photoelectric cell.

96.

Self aldol



Cross Aldol



$$E_{\text{cell}} = E_{\text{cell}}^{\circ} - \frac{0.059}{n} \log \frac{[\text{Ni}^{+2}]^1}{[\text{Ag}^+]^2}$$

$$E_{\text{cell}} = 10.5 - \frac{0.059}{2} \log \frac{10^{-3}}{(10^{-3})^2}$$

$$= 10.5 - \frac{0.059}{2} \log 10^3$$

$$= 10.5 - \frac{0.059}{2} \times 3 = 10.4115 \text{ V}$$

(Calculated answer is not given in options)

98. Acc. to Bohr's atomic model

$$r \propto \frac{n^2}{Z} \quad 3^{\text{rd}} \text{ orbit of } \text{Li}^{+2} \quad n_1 = 3$$

$$Z_1 = 3$$

$$\Rightarrow \quad 2^{\text{nd}} \text{ orbit of } \text{He}^+ \quad n_2 = 2$$

$$Z_2 = 2$$

$$\frac{(r_3)_{\text{Li}^{+2}}}{(r_2)_{\text{He}^+}} = \frac{n_1^2}{n_2^2} \times \frac{Z_2}{Z_1}$$

$$\frac{(r_3)_{\text{Li}^{+2}}}{105.8 \text{ pm}} = \frac{3 \times 3}{2 \times 2} \times \frac{2}{3}$$

$$(r_3)_{\text{Li}^{+2}} = 158.7 \text{ pm}$$

99. $d = \frac{Z \times M}{N_A \times a^3}$

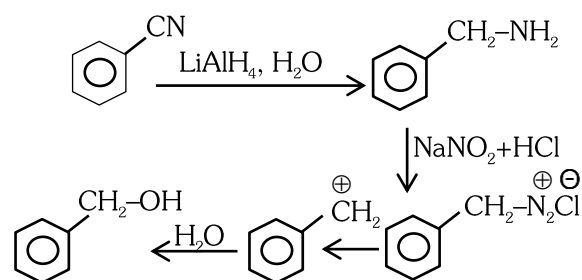
$$8.92 = \frac{4 \times M}{6.022 \times 10^{23} \times (3.608 \times 10^{-8})^3}$$

$$M = \frac{8.92 \times 6.022 \times 10^{23}}{4} \times 46.96 \times 10^{-24}$$

$$M = 63.1 \text{ g/mol (Molar Atomic Mass)}$$

$$M = 63.1 \text{ u (Atomic Mass)}$$

100.



101. **Statement (a)** In roots, xylem and phloem in a vascular bundle are arranged in an alternate manner along the different radii.

However as per the NCERT XI chapter. 6, page number 90, para, 1 says

"When xylem and phloem within a vascular bundle are arranged in an alternate manner on different radii?"

Why statement (a) is less correct, there are some reasons to explain :

1. Statement given in NCERT and question are although seems to be similar with a similar basic sense however use of "within" and "in" cannot be used interchangeably in every context.
2. For explaining location and theoretical boundaries; within is more appropriate as compared to in.
3. Within is closer to inside and thus more correct.
4. Within (used as preposition) used as a function word to indicate enclosure or containment.
5. Within (used as an adjective) used in a sense of being inside.

Use of "in" instead of "within" makes it less appropriate and herewith less correct.

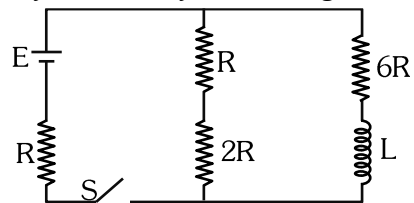
193. According to NCERT the dangers of particulate matter that are very very small are not removed by those precipitators.

(Here very very small particles size are $< 1 \mu\text{m}$).

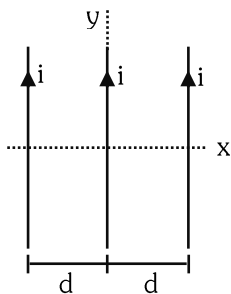
NEET(UG) – 2021 (PAPER-2)

- In Young's double slit experiment, the ratio of amplitude of light coming from two slits is 2:3. If I_0 be the maximum intensity the resultant intensity I when they interfere at path difference $\lambda/3$ (λ = wavelength of light) will be
 (1) $\frac{3I_0}{25}$ (2) $\frac{6I_0}{25}$ (3) $\frac{7I_0}{25}$ (4) $\frac{9I_0}{25}$
- Angular width of central maximum of a diffraction pattern on a single slit depends on
 I. Distance between slit and source
 II. Wavelength of light used
 III. Width of the slit
 (1) I, II (2) II, III (3) I, III (4) I, II, III
- An object moving at a speed 40 cm/s towards a concave mirror of focal length 20 cm. When the object is at distance 60 cm, the speed of image is
 (1) 15 cm/s (2) 20 cm/s
 (3) 10 cm/s (4) 5 cm/s
- A plano-convex lens made of material of refractive index $5/3$ and of radius of curvature 40 cm is silvered on its plane surface. It will behave like a
 (1) Concave mirror of focal length 12 cm
 (2) Concave mirror of focal length 30 cm
 (3) Convex mirror of focal length 12 cm
 (4) Convex mirror of focal length 30 cm
- Resolving power of a microscope depends on
 (1) The focal length and aperture of the eye lens
 (2) The focal length of the objective and eye lens
 (3) The apertures of the objective and the eye lens
 (4) The wavelength of light illuminating the object
- A gate has the following truth table.

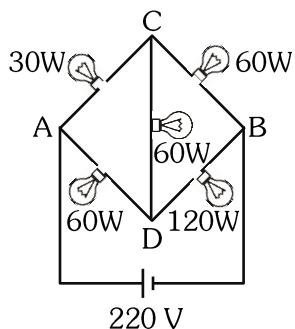
A	B	X
0	0	0
0	1	1
1	0	1
1	1	0

 The gate is
 (1) NOR (2) NAND
 (3) AND (4) XOR
- For a transistor, if parameter $\alpha = 0.9$ and transistor is connected in common emitter configuration. The change in the collector current when the base current change by 4 mA is
 (1) 4 mA (2) 3.6 mA
 (3) 12 mA (4) 36 mA
- When p-n junction is in forward bias
 (1) Diffusion current = Drift current, net current = 0
 (2) Diffusion current > Drift current, net current from p to n
 (3) Diffusion current > Drift current, net current from n to p
 (4) Diffusion current < Drift current, net current from n to p
- Half life of a radioactive substance is 5 min. The time between 20% and 80% decay will be
 (1) 5 min (2) 10 min
 (3) 15 min (4) 20 min
- A helium ion is in excited state of quantum number $4n$, a photon of energy 10.2 eV is emitted. The value of n is
 (1) 1 (2) 2 (3) 3 (4) 4
- In photoelectric effect experiment, the incident wavelength λ is decreases to $\lambda/4$, then ratio of final maximum kinetic energy to initial maximum kinetic energy of emitted electron will be ($\lambda > \lambda_0$) where λ_0 is threshold wavelength.
 (1) Equal to 4 (2) More than 4
 (3) Less than 4 (4) Equal to 2
- A particle of mass m is moving with velocity v and its de-Broglie wavelength is λ . If mass is increased by 20% and velocity is decreased by 50% then new de-Broglie wavelength will be
 (1) $\frac{3\lambda}{4}$ (2) $\frac{3\lambda}{5}$ (3) $\frac{4\lambda}{3}$ (4) $\frac{5\lambda}{3}$
- If switch is closed at $t = 0$, the current supplied by battery immediately after closing the switch is

 (1) $\frac{E}{3R}$ (2) $\frac{E}{4R}$ (3) $\frac{E}{7R}$ (4) $\frac{E}{R}$
- In a circuit with coil of resistance 5Ω , the magnetic flux changes from 20 Weber to 10 Weber in 0.1 second. The charge that flows in the coil during this time is
 (1) 1 coulomb (2) 2 coulomb
 (3) 6 coulomb (4) 4 coulomb

15. When a d.c. voltage of 100 V is applied to a coil of self-inductance $(\sqrt{3}/\pi)\text{H}$, a current of 1 A flows through it, when an a.c. source of 100 V is applied across the coil, the current in the coil becomes 0.5A. The frequency of a.c. supply is
 (1) 30 Hz (2) 50 Hz
 (3) 60 Hz (4) 100 Hz
16. The magnetic susceptibility of any paramagnetic material changes with absolute temperature T is
 (1) Directly proportional to T
 (2) Remains constant
 (3) Inversely proportional to T
 (4) Exponentially decaying with T
17. Three long parallel wires carrying same current i in the x-y plane, the middle wire is along y-axis as shown in the figure. Now the middle wire is displaced by distance z along z-axis, so the magnetic force per unit length acting on it is

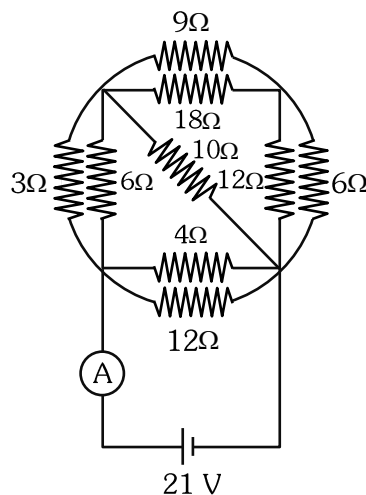


- (1) $\frac{\mu_0 i^2 z}{2\pi(d^2 + z^2)}$ (2) $\frac{\mu_0 i^2 z}{\pi(d^2 + z^2)}$
 (3) $\frac{\mu_0 i^2}{2\pi(d^2 + z^2)^{1/2}}$ (4) $\frac{\mu_0 i^2}{\pi(d^2 + z^2)^{1/2}}$
18. A long wire carrying a current I is bent at right angle. The magnitude of magnetic field at height d above the point of bending is
 (1) $\frac{\mu_0 I}{2\pi d}$ (2) $\frac{\sqrt{2}\mu_0 I}{2\pi d}$ (3) $\frac{\mu_0 I}{2\sqrt{2}\pi d}$ (4) $\frac{\mu_0 I}{4\sqrt{2}\pi d}$
19. Five bulbs each have same voltage rating 220 V are connected as shown in the figure. The total power consumed in the circuit is



- (1) 20 W (2) 40 W (3) 60 W (4) 100 W

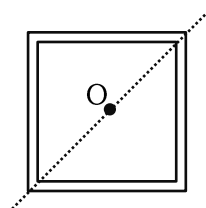
20. In the circuit as shown, the reading of ideal ammeter is



- (1) 5 A (2) 8 A (3) 9 A (4) 10 A
21. Kirchhoff's voltage law is based on the conservation of
 (1) Charge (2) Energy
 (3) Momentum (4) Current
22. Choose the wrong option :
 (1) The capacitance of spherical capacitor is $\frac{4\pi\epsilon_0 r_1 r_2}{r_1 - r_2}$
 (2) The energy density between plates of capacitor is $\frac{1}{2}\epsilon_0 E^2$.
 (3) The force between plates of parallel plate capacitor is $\frac{Q^2}{2A\epsilon_0}$.
 (4) The capacitance of cylindrical capacitor is $\frac{2\pi\epsilon_0}{\ln(r_2/r_1)}$
23. Three point charges $\sqrt{3}Q, -\sqrt{3}Q$ and $\sqrt{3}Q$ are placed on the vertices of an equilateral triangle of side L . How much work will be done in displacing a point charge q from the mid-point of a side containing charges $\sqrt{3}Q, 4$ & $\sqrt{3}Q$ to the centre of triangle ?
 (1) $\frac{1}{4\pi\epsilon_0} \cdot \frac{\sqrt{3}Qq}{L}$ (2) $\frac{1}{4\pi\epsilon_0} \cdot \frac{Qq}{\sqrt{3}L}$
 (3) $\frac{1}{4\pi\epsilon_0} \cdot \frac{\sqrt{2}Qq}{L}$ (4) $\frac{1}{4\pi\epsilon_0} \cdot \frac{Qq}{L}$

24. When an ideal gas is heated at constant pressure, the fraction of heat energy supplied which increases the internal energy of the gas are α , β and δ for CO_2 , He and N_2 respectively, then
 (1) $\alpha = \beta = \delta$ (2) $\alpha > \beta > \delta$
 (3) $\beta > \delta > \alpha$ (4) $\delta > \beta > \alpha$
25. Choose the wrong pair.
Process Work done
 (1) Adiabatic $\frac{nR(T_2 - T_1)}{\gamma - 1}$
 (2) Isobaric $nR(T_2 - T_1)$
 (3) Isothermal $nRT \ln\left(\frac{P_1}{P_2}\right)$
 (4) Isochoric Zero
26. A black body of surface area 20 cm^2 is heated to 227° and is suspended in a room at temperature 27°C . The initial rate of loss of heat from the body at the room temperature will be (take emissivity = 0.5, Stefan's constant $\sigma = 6 \times 10^{-8} \text{ W/m}^2\text{K}^4$)
 (1) 1.6 W (2) 3.2 W
 (3) 4.8 W (4) 6.4 W
27. When 10 g of water at 0°C and 10^5 N/m^2 pressure is converted into ice of volume 11 cm^3 , the external work done will be
 (1) 0.1 J (2) 0.2 J (3) 1 J (4) 2 J
28. A mass m is vertically suspended from a spring of negligible mass, the system oscillates with a frequency f . Now spring is cut into two equal parts, these parts are connected in parallel and a mass $4m$ is suspended, the new frequency of oscillation will be
 (1) f (2) $2f$ (3) $3f$ (4) $4f$
29. Two vibrating strings A and B of same material but lengths $2L$ and $3L$ have radii $3r$ and $2r$ respectively. They are stretched under same tension. String A vibrates in fundamental mode and string B in second overtone. The ratio of their frequencies n_A/n_B will be
 (1) 1 : 2 (2) 1 : 3
 (3) 1 : 4 (4) 2 : 3
30. If a pipe gives notes of frequencies 255, 425 and 595, what is fundamental frequency of the pipe and its type?
 (1) 85, open pipe (2) 17, closed pipe
 (3) 51, open pipe (4) 85, closed pipe

31. Orbital velocity of an artificial satellite depends upon
 I. Mass of the earth
 II. Mass of the satellite
 III. Radius of the earth
 (1) I, II (2) I, III
 (3) II, III (4) I, II, III
32. A soap bubble in vacuum has radius r_1 and another soap bubble in vacuum has radius r_2 . If the bubbles coalesce under isothermal condition, then the radius of the new bubble is
 (1) $\frac{r_1 + r_2}{2}$ (2) $(r_1^2 + r_2^2)^{1/2}$
 (3) $\frac{r_1 r_2}{r_1 - r_2}$ (4) $\frac{r_1 r_2}{r_2 - r_1}$
33. An open rectangular vessel when full of petrol takes $20\sqrt{2}$ minutes to be emptied through an orifice in its bottom. How much time will it take to be emptied when half filled with petrol? (Neglect evaporation of petrol)
 (1) 10 min (2) 15 min
 (3) 20 min (4) 25 min
34. When a man stands on a turn-table stretching with two equal loads in hands and rotates, then he folds his arm.
 I. Linear momentum is conserved
 II. Angular momentum is conserved
 III. Angular velocity increases
 IV. Kinetic energy decreases
 (1) I, II (2) I, III
 (3) II, III (4) III, IV
35. Four identical rods each of mass M and length L , form a square as shown in the figure. The moment of inertia of this system about diagonal of the square is

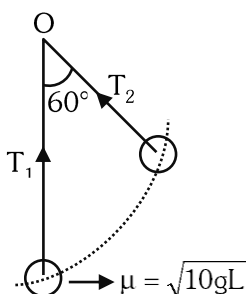


- (1) $\frac{2}{3}ML^2$ (2) $\frac{4}{3}ML^2$ (3) $\frac{5}{3}ML^2$ (4) $\frac{10}{3}ML^2$

36. A ball of mass m moving with some velocity strikes another ball of mass $2m$ at rest. If collision is head-on and final kinetic energy of the system is half of initial kinetic energy of system, then the value of coefficient of restitution e is

(1) $\frac{1}{2}$ (2) $\frac{1}{\sqrt{2}}$ (3) $\frac{1}{3}$ (4) $\frac{1}{\sqrt{3}}$

37. A ball of mass m is attached to a string of length L and given a horizontal velocity $\sqrt{10gL}$ at its lowest point as shown. The ratio of tension in the string when it has turned an angle 60° to initial tension, i.e. T_2/T_1 is

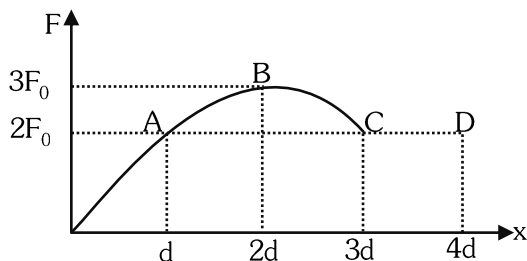


(1) $\frac{17}{21}$ (2) $\frac{19}{21}$ (3) $\frac{19}{22}$ (4) $\frac{17}{23}$

38. A ball of mass m is thrown with velocity v_0 at an angle 60° with horizontal. The instantaneous power delivered by gravitational force at the highest point of its trajectory is

(1) $\frac{mgv_0}{2}$ (2) Zero
(3) $\frac{\sqrt{3}mgv_0}{2}$ (4) $\frac{mgv_0}{\sqrt{2}}$

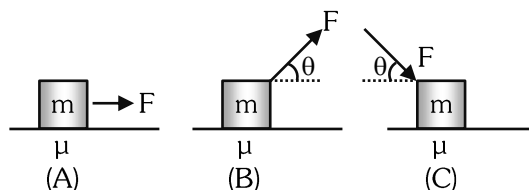
39. The force-displacement graph of a particle moving in a straight line is as shown in the figure.



The work done by force for displacement $x = d$ to $x = 3d$ will be (ABC is semi-ellipse)

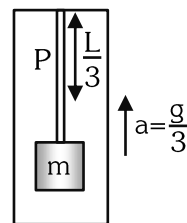
(1) $2\pi F_0 d$ (2) $4F_0 d$
(3) $(2\pi + 4)F_0 d$ (4) $(2\pi - 4)F_0 d$

40. In the three cases, as shown in the figure, blocks are moving with constant velocity, the friction in (A), (B) and (C) is f_A , f_B and f_C . Then



(1) $f_A > f_B > f_C$ (2) $f_C > f_B > f_A$
(3) $f_C > f_A > f_B$ (4) $f_A = f_B = f_C$

41. A block of mass m is attached to a uniform string of mass $3m$ and length L as shown in the figure. The lift is moving upward with acceleration $a = g/3$. the tension in the string at point P is



(1) $2mg$ (2) $4mg$
(3) $3mg$ (4) mg

42. The dimensions of mobility of electrons are

(1) $M^{-1}LA^2$ (2) $MT^{-2}A^{-1}$
(3) $M^{-1}T^2A$ (4) $M^{-1}T^2A^{-1}$

43. A particle starts from origin with zero initial velocity along x-axis. If velocity and displacement are related as $v = ax^{-2}$, where a is constant. The displacement of particle after time t is

(1) $(at)^{1/2}$ (2) $(3at)^{1/3}$
(3) $(2at)^{1/2}$ (4) $(2at)^{1/3}$

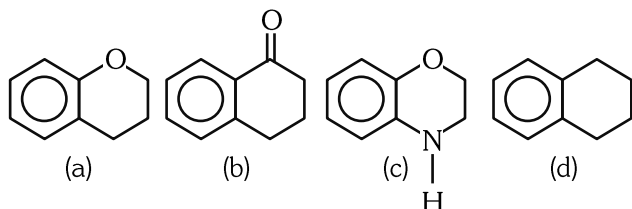
44. If ball is thrown from some height at an angle with horizontal, for maximum horizontal range, the angle of projection should be

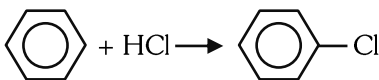
(1) Zero (2) 45°
(3) $>45^\circ$ (4) $<45^\circ$

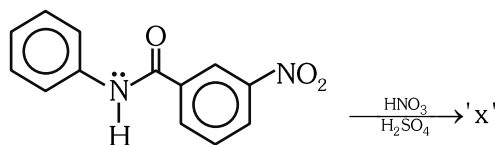
45. Two adjacent side of a parallelogram are represented by the two vectors $3\hat{i} + 4\hat{j} + 5\hat{k}$ and $\hat{i} - \hat{j} - \hat{k}$. The area of parallelogram is

(1) $\sqrt{74}$ (2) $\sqrt{94}$
(3) $\sqrt{104}$ (4) $\sqrt{114}$

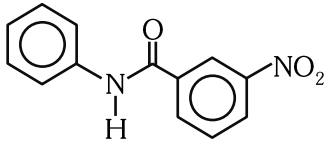
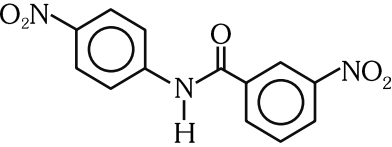
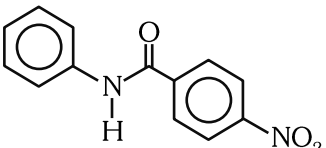
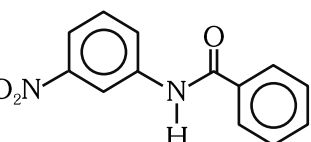
46. An organic compound on analysis gave C = 54.5%, H = 9.1% by mass. Its empirical formula is
 (1) CHO_2 (2) CH_2O
 (3) $\text{C}_2\text{H}_4\text{O}$ (4) $\text{C}_3\text{H}_4\text{O}$
47. Rank the following compounds in decreasing order of reactivity towards electrophilic aromatic substitution reaction (ESR).



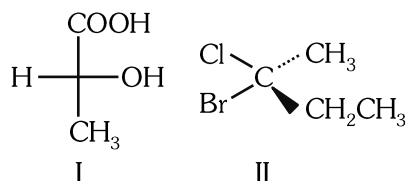
- (1) (c) > (a) > (b) > (d) (2) (c) > (a) > (d) > (b)
 (3) (d) > (c) > (b) > (a) (4) (a) > (c) > (d) > (b)
48. Which of the following reactions is not possible?
 (1) $\text{HC} \equiv \text{CH} + \text{NaOH} \rightarrow \text{HC} \equiv \text{CNa} + \text{H}_2\text{O}$
 (2) 
 (3) $\text{C}_2\text{H}_5\text{OH} + \text{NaCl} \rightarrow \text{C}_2\text{H}_5\text{Cl}$
 (4) All of the these
49. In the following reaction,



the structure of major product 'X' is

- (1) 
 (2) 
 (3) 
 (4) 

50. The correct configuration assigned for compounds (I) and (II) respectively is



- (1) R, R (2) S, S
 (3) R, S (4) S, R
51. 0.32 g of a metal gave on treatment with an acid 112 mL of hydrogen at NTP. Calculate the equivalent weight of the metal.
 (1) 58 (2) 32
 (3) 11.2 (4) 24
52. If 1 mL of water contains 20 drops then number of molecules in a drop of water is
 (1) 6.023×10^{23} (2) 1.673×10^{21}
 (3) 1.344×10^{18} (4) 4.346×10^{20}
53. The Cl-C-Cl bond angle in 1, 1, 2, 2-tetrachloroethene and tetrachloromethane respectively are
 (1) 120° and 109.5° (2) 90° and 109.5°
 (3) 109.5° and 90° (4) 109.5° and 120°
54. An electrolytic cell contains a solution of Ag_2SO_4 and has platinum electrodes. A current is passed until 1.6g of O_2 has been liberated at anode. The amount of silver deposited at cathode will be
 (1) 108 g (2) 1.6 g
 (3) 0.8 g (4) 21.60 g
55. The work function for a metal is 4 eV. To emit a photoelectron of zero velocity from the surface of the metal, the wavelength of incident light should be
 (1) 2700 Å (2) 1700 Å
 (3) 5900 Å (4) 3100 Å
56. The bonds present in borazole are
 (1) $12\sigma, 3\pi$ (2) $9\sigma, 6\pi$
 (3) $6\sigma, 6\pi$ (4) $9\sigma, 9\pi$

57. Which is/are correct statements about P_4O_6 and P_4O_{10} ?

- (1) Both form oxoacids H_3PO_3 and H_3PO_4 respectively
- (2) In P_4O_6 each P is joined to three O and in P_4O_{10} each P is linked to four O atoms.
- (3) Both (1) and (2)
- (4) None of the above

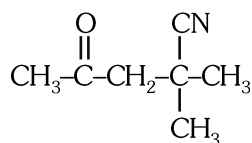
58. Which of the following statements regarding H_2O_2 is wrong?

- (1) It is stable in acidic medium.
- (2) It acts as oxidising as well as reducing agent.
- (3) It has zero dipole moment.
- (4) Pure H_2O_2 is slightly acidic.

59. Which of the following alcohols on dehydration with conc. H_2SO_4 at 440 K will give propylene?

- (i) *n*-propyl alcohol (ii) Isobutyl alcohol
- (iii) Isopropyl alcohol (iv) *n*-butyl alcohol
- (1) (ii), (iii) (2) (i), (iii)
- (3) (i), (ii), (iii) (4) (ii), (iii), (iv)

60. The IUPAC name of the compound



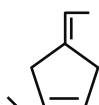
- (1) 2-Cyano-2-methyl-4-oxopentane
- (2) 4-Cyano-4-methyl-2-pentanone
- (3) 4-Cyano-4-methyl-2-oxopentane
- (4) 2, 2-Dimethyl-4-oxopentanenitrile

61. $\text{Ph}-\text{C}(\text{CH}_3)=\text{CH}_2 \xrightarrow{\text{Cl}_2+\text{H}_2\text{O}}$ 'A'

Compound (A) is

- (1) $\text{Ph}-\text{C}(\text{CH}_3)(\text{OH})-\text{CH}_2\text{Cl}$ (2) $\text{Ph}-\text{C}(\text{CH}_3)(\text{Cl})-\text{CH}_2\text{OH}$
- (3) $\text{Ph}-\text{C}(\text{CH}_3)(\text{Cl})-\text{CH}_2-\text{Cl}$ (4) $\text{Ph}-\text{C}(\text{CH}_3)(\text{H})-\text{CH}_2-\text{OH}$

62. If the following compound is treated with Pd/C in excess of H_2 gas, how many stereoisomers of the product will be obtained?



- (1) 1 (2) 2 (3) 3 (4) 4

63. Which of the following alkyl halides is not suitable for Corey house synthesis of alkanes?

- (1) CH_3I (2)
- (3)
- (4)

64. Which of the following statements are True (T) and which are False (F)?

S_1 : Cubic system have four possible type of unit cells.

S_2 : H_2O is diamagnetic substance and it is weakly attracted in magnetic field.

S_3 : Graphite is a covalent solid with van der Waal's forces as well.

- (1) F F T (2) F T F
- (3) T F F (4) F F F

65. A mixture of organic compound A and B when dissolve in NaOH, A is soluble and its residue B gives positive test with $\text{Zn}/\text{NH}_4\text{Cl}$ followed by $\text{AgNO}_3 + \text{NH}_4\text{OH}$, (Mulliken's-Barker test). Identify A and B

- (1) , (2) ,
- (3) , (4) ,

66. The range of radius ratio (cationic to anionic) for an octahedral arrangement of ions in an ionic solid is

- (1) 0 – 0.155 (2) 0.155 – 0.225
- (3) 0.225 – 0.414 (4) 0.414 – 0.732

67. The specific conductance of a saturated solution of silver bromide is $k \text{ S cm}^{-1}$. The limiting ionic conductivity of Ag^+ and Br^- ions are x and y , respectively. The solubility of silver bromide in g L^{-1} is : (Molar mass of $\text{AgBr} = 188$)

- (1) $\frac{k \times 1000}{x - y}$
- (2) $\frac{k}{x + y} \times 188$
- (3) $\frac{k \times 1000 \times 188}{x + y}$
- (4) $\frac{x + y}{k} \times \frac{1000}{188}$

68. The charring product when $C_6H_{12}O_6$ is heated with conc. H_2SO_4 is due to
 (1) oxidation (2) reduction
 (3) dehydration (4) dehydrogenation

69. Which of the following polymers can be used for lubrication and as an insulator?
 (1) SBR (2) PVC
 (3) PTFE (4) PAN

70. Match the columns.

List I

- a. IF_2^\ominus
 b. HCN
 c. PCl_4^+
 d. XeF_4

List II

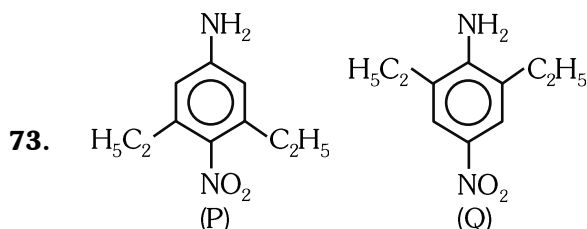
- i. sp
 ii. sp^3d
 iii. sp^3d^2
 iv. sp^3

- (1) a – i, b – iv, c – ii, d – iii
 (2) a – ii, b – i, c – iv, d – iii
 (3) a – iii, b – ii, c – i, d – iv
 (4) a – iv, b – iii, c – ii, d – i

71. Metal 'M' + air $\xrightarrow{\Delta}$ A $\xrightarrow{H_2O}$ B \xrightarrow{HCl} white fumes. Metal 'M' can be
 (1) Li (2) Mg
 (3) Al (4) All of these

72. Which among the following statements are correct?

- (a) $\ddot{C}F_2$ is more stable than $\ddot{C}Cl_2$
 (b) $\ddot{C}Cl_2$ is more stable than $\ddot{C}Br_2$
 (c) Singlet $\ddot{C}H_2$ is more stable than triplet $\ddot{C}H_2$
 (d) Singlet $\ddot{C}H_2$ has planar geometry
 (1) (a), (b), (d) (2) (b), (c), (d)
 (3) (a), (b), (c) (4) only (a)



- (1) – NO_2 in (P) has weaker inductive effect
 (2) – NO_2 in (P) has stronger – M group
 (3) – NO_2 in (Q) has stronger – M group
 (4) – NO_2 in (Q) has weaker – M group

74. Which of the following has greater bond length?
 (1) P – O (2) S – O
 (3) Cl – O (4) O = O

75. Which of the following gives white precipitate with ammoniacal $AgNO_3$?

- (1) C_2H_6 (2) C_3H_4
 (3) C_3H_8 (4) C_4H_{10}

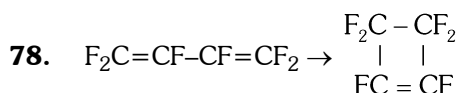
76. A solid compound 'X' on heating gives CO_2 and a residue. The residue mixed with water forms 'Y'. On passing an excess of CO_2 through 'Y' in water, a clear solution 'Z' is obtained. On boiling 'Z', compound 'X' is reformed. The compound 'X' is

- (1) $CaCO_3$
 (2) Na_2CO_3
 (3) K_2CO_3
 (4) $Ca(HCO_3)_2$

77. Silver iodide is used in cloud seeding to produce rain $AgI_{(s)} \rightleftharpoons Ag^+(aq) + I^-(aq)$; $K_{sp} = 8.5 \times 10^{-7}$

$AgNO_3$ and KI are mixed to give $[Ag^+] = 0.010M$; $[I^-] = 0.015M$. Will AgI precipitate?

- (1) Yes
 (2) No
 (3) Can't say
 (4) Depends on $[NO_3^-]$ and $[K^+]$



for this reaction (ring closure), $\Delta H = -49 \text{ kJ mol}^{-1}$, $\Delta S = -40.2 \text{ J K}^{-1} \text{ mol}^{-1}$. Upto what temperature is the forward reaction spontaneous?

- (1) $1492^\circ C$ (2) $1219^\circ C$
 (3) $946^\circ C$ (4) $1080^\circ C$

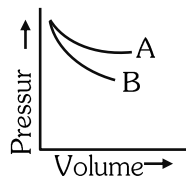
79. 200 mL of 0.1 M H_3BO_3 solution on complete neutralisation requires mL of 0.5 M $NaOH$ solution.

- (1) 20 mL (2) 40 mL
 (3) 120 mL (4) 80 mL

80. Poisonous gas present in the exhaust fumes of car is

- (1) CH_4 (2) CO
 (3) CO_2 (4) C_2H_2

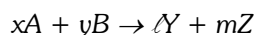
81. P-V plots for two gases during adiabatic processes are given in the given figure.



Plot A and plot B should correspond to

- (1) He and O₂
 - (2) He and Ar
 - (3) O₂ and He
 - (4) O₂ and F₂
82. Amongst sodium halides (NaF, NaCl, NaBr and NaI), NaF has the highest melting point because of
- (1) highest oxidising power
 - (2) lowest polarity
 - (3) maximum ionic character
 - (4) minimum ionic character
83. The most enolic form of 2,4-pentanedione is
- (1) $\text{CH}_2=\overset{\text{OH}}{\underset{|}{\text{C}}}-\text{CH}_2-\overset{\text{O}}{\underset{||}{\text{C}}}-\text{CH}_3$
 - (2) $\text{CH}_2-\overset{\text{OH}}{\underset{|}{\text{C}}}=\text{CH}-\overset{\text{O}}{\underset{||}{\text{C}}}-\text{CH}_3$
 - (3) $\text{CH}_2-\overset{\text{OH}}{\underset{|}{\text{C}}}-\text{C}=\overset{\text{OH}}{\underset{|}{\text{C}}}-\text{CH}_3$
 - (4) $\text{CH}_3-\overset{\text{OH}}{\underset{|}{\text{C}}}=\text{C}=\overset{\text{OH}}{\underset{|}{\text{C}}}-\text{CH}_3$
84. In SiF_6^{2-} and SiCl_6^{2-} which one is known and why?
- (1) SiF_6^{2-} because of small size of F
 - (2) SiF_6^{2-} because of large size of F
 - (3) SiCl_6^{2-} because of small size of Cl
 - (4) SiCl_6^{2-} because of large size of Cl
85. Equivalent amounts of H₂ and I₂ are heated in a closed container till equilibrium is obtained. If 80% of the hydrogen can be converted to HI, then K_c at this temperature
- (1) 64
 - (2) 16
 - (3) 0.25
 - (4) 4

86. For the homogeneous reactions :



$\Delta H = -30 \text{ kJ mol}^{-1}$, $\Delta S = -100 \text{ J K}^{-1} \text{ mol}^{-1}$. At what temperature the reaction is at equilibrium?

- (1) 50°C
 - (2) 250°C
 - (3) 100 K
 - (4) 27°C
87. The value of x is maximum for
- (1) $\text{MgSO}_4 \cdot x\text{H}_2\text{O}$
 - (2) $\text{CaSO}_4 \cdot x\text{H}_2\text{O}$
 - (3) $\text{BaSO}_4 \cdot x\text{H}_2\text{O}$
 - (4) All have the same value of x
88. The equivalent weight of the salt $\text{KHC}_2\text{O}_4 \cdot \text{H}_2\text{C}_2\text{O}_4 \cdot 4\text{H}_2\text{O}$ used as reducing agent is
- (1) $\frac{\text{Mol. wt}}{1}$
 - (2) $\frac{\text{Mol. wt}}{2}$
 - (3) $\frac{\text{Mol. wt}}{3}$
 - (4) $\frac{\text{Mol. wt}}{4}$
89. 100 ml of a mixture of NaOH and Na₂SO₄ is neutralised by 10 ml of 0.5 M H₂SO₄. Hence NaOH in 100 ml solution is
- (1) 0.2g
 - (2) 0.4 g
 - (3) 0.6 g
 - (4) 0.8 g
90. A sample of phosphorous trichloride (PCl₃) contains 1.4 moles of the substance. How many atoms are there in the sample?
- (1) 4
 - (2) 5.6
 - (3) 8.431×10^{23}
 - (4) 3.372×10^{24}

91. Whether a tall plant from F_1 or F_2 has TT or Tt composition, it can be predicted by
 (1) Monohybrid cross
 (2) Out cross
 (3) Dihybrid cross
 (4) Test cross
92. Vegetative propagation in mint and jasmine occurs by
 (1) Runner (2) Sucker
 (3) Stolon (4) Offset
93. Which of the following organic compound is correctly related with its function ?
 (1) Uridine – A nucleotide that makes up RNA
 (2) Phosphoglycerides – A component of cell membrane
 (3) Serine – A non-protein amino acid
 (4) GLUT-4 – Inhibits glucose transport into cells
94. Match the columns and choose the correct option.

Column I	Column II
a. Visible light	i. 0.1–1.0 nm
b. Ultraviolet radiation	ii. 400–700 nm
c. X-rays	iii. Longer than 700 nm
d. Infrared radiation	iv. 100–400 nm

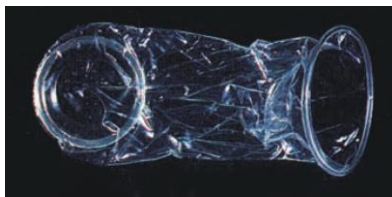
 (1) a–i, b–ii, c–iv, d–ii
 (2) a–iii, b–ii, c–i, d–iv
 (3) a–iv, b–iii, c–ii, d–i
 (4) a–ii, b–iv, c–i, d–iii
95. Separation of leaf pigments of any green plants can be carried out by
 (1) X-ray radiography
 (2) Paper chromatography
 (3) Half-leaf experiment
 (4) Variegated leaf experiment
96. Which of the following types of teeth differ in number in deciduous teeth and adult teeth ?
 (a) Incisors (b) Canine
 (c) Molars (d) Premolars
 (1) (a) and (b) (2) (c) only
 (3) (c) and (d) (4) (d) only
97. Which of the following is incorrect combination ?
 (1) XO-type sex determination–Grasshopper
 (2) XY-type sex determination–*Drosophila*
 (3) ZW-type sex determination–*Pavo*
 (4) X-body–Morgan

98. Find the correct statement about chemical which is obtained from given plant.



- (1) Excessive doses causes hallucination
 (2) Abused by some sport person
 (3) Producing a sense of euphoria
 (4) These are known for their effects on cardiovascular system of the body
99. Which of following is a correct statement ?
 (1) Surgical methods of contraception prevent gamete formation.
 (2) In E.T. techniques, embryos are always transferred into the uterus.
 (3) All sexually transmitted diseases are not completely curable.
 (4) Oral pills are very popular contraceptives among the rural women.
100. Which of the following is not a correct statement?
 (1) Herbaria serve as quick referral systems in taxonomical studies.
 (2) Indian Botanical Garden is situated at Lucknow, India.
 (3) Museums have collections of preserved plant and animal specimens.
 (4) The keys are based on the contrasting characters.
101. Which of the following step is not involved in Southern blot hybridisation ?
 (1) Electrophoresis
 (2) Autoradiography
 (3) Hybridisation
 (4) Mutation

102. Which of the following is incorrect for the given figure ?



- (1) It covers the vagina and cervix.
- (2) It protects the user from contracting STDs and AIDS.
- (3) It gives privacy to the user.
- (4) This barrier is reusable.

103. Match the columns.

Column I

- a. Arsenic
- b. Nitrate
- c. Mercury
- d. Cadmium
- e. Fluoride

Column II

- i. Minamata disease
- ii. Itai-itai
- iii. Blue-baby syndrome
- iv. Skeletal fluorosis
- v. Black foot disease

- (1) a–v, b–iii, c–i, d–ii, e–iv
- (2) a–ii, b–iii, c–v, d–i, e–iv
- (3) a–iii, b–iv, c–v, d–i, e–ii
- (4) a–v, b–iv, c–iii, d–ii, e–i

104. Read A to D and tell the correct order of components from outer side to inner side in a young dicot stem.

- (A) Cortex (B) Pericycle
(C) Epidermis (D) Pith

- (1) C, D, B, A
- (2) A, B, C, D
- (3) C, A, B, D
- (4) C, B, A, D

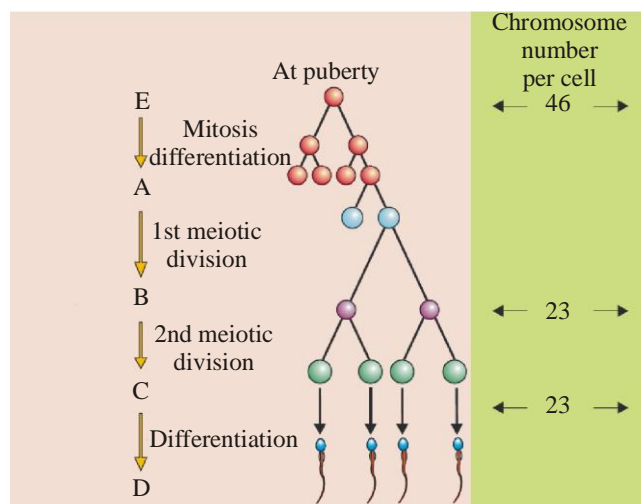
105. In the plastid, the site of dark and light reaction is

- (1) Grana and stroma respectively
- (2) Grana and matrix respectively
- (3) Matrix and grana respectively
- (4) Stroma and grana respectively

106. Which of the following step cannot be considered as a process of regulation of gene expression in eukaryotes ?

- (1) Translational level
- (2) Transcriptional level
- (3) Replication level
- (4) Processing level

107. Spermatogenesis is the process of transformation of



- (1) A to B
- (2) B to C
- (3) C to D
- (4) E to A

108. The maximum absorption of light by chlorophyll occurs in which region of the absorption spectrum.

- (1) Red and green
- (2) Yellow and green
- (3) Blue and red
- (4) Brown and red

109. Which is not a function of muscular tissue ?

- (1) Locomotion and change in body postures
- (2) Transportation of food through digestive tract
- (3) Transportation of gametes through genital tract
- (4) Transmit different kinds of stimuli

110. Which of the following conditions of the zygotic cell would lead to the birth of a normal human male child ?

- (1) Two X-chromosomes
- (2) Only one Y-chromosome
- (3) Only one X-chromosome
- (4) One X-and one Y-chromosome

111. Match the columns and find the correct option.

Column I

- a. Ascomycetes
- b. Phycomycetes
- c. Basidiomycetes
- d. Deuteromycetes

Column II

- i. *Ustilago*
- ii. *Saccharomyces*
- iii. *Trichoderma*
- iv. *Albugo*

- (1) a–ii, b–i, c–iv, d–iii
- (2) a–iv, b–iii, c–ii, d–i
- (3) a–ii, b–iv, c–i, d–iii
- (4) a–iii, b–iv, c–i, d–ii

112. Consider the following statements and choose the correct option.

- (a) The ovule is attached to the placenta by means of a stalk called hilum.
- (b) Funicle represents the junction between ovule and hilum.
- (c) Each ovule has one or two protective envelopes called integuments.
- (d) A small opening is present at the tip of ovule called micropyle.

- (1) (a) and (b) (2) (b) and (c)
- (3) (c) and (d) (4) (a) and (d)

113. Which of the following characters belongs to the kingdom Protista ?

- (1) Prokaryotic
- (2) Multicellular
- (3) All members have cell wall
- (4) Presence of nuclear membrane

114. Mammals were evolved from

- (1) Sauropsids (2) Synapsids
- (3) Thecodonts (4) *Tyrannosaurus*

115. The following figure represents the root system of



- (1) *Triticum* (2) Mango
- (3) Banyan (4) *Brassica*

116. Which of the following match is incorrect ?

- (1) Miller's experiment – 1953
- (2) Discovery of Penicillin – 1945
- (3) Human Genome Project – 1990
- (4) Rediscovery of Mendelian results – 1900

117. Among mustard, mulathi, watermelon, soybean, pumpkin, ashwagandha, *Asparagus*, brinjal, *Allium*, *Trifolium*, Rose, *Indigofera*, bitter gourd, plum, cucumber, arhar, moong and peach, how many plants have hypogynous flowers ?

- (1) Three (2) Ten
- (3) Four (4) Eleven

118. Find the wrongly matched pair.

- (1) *Clarias gariepinus* – African cat fish
- (2) Himalaya – Hotspot
- (3) Aravalli hills – Sacred groves
- (4) Earth Summit – South Africa

119. Match the columns.

Column I

Column II

- | | |
|--------------------------|--------------------------------------|
| a. Endoplasmic reticulum | i. Stack of cisternae |
| b. Sphaerosomes | ii. Stores oil |
| c. Dictyosomes | iii. Synthesis and storage of lipids |
| d. Peroxisomes | iv. Photorespiration |
| e. Elaioplasts | v. Detoxification of drugs |

- (1) a–v, b–iii, c–i, d–iv, e–ii
- (2) a–v, b–iii, c–ii, d–iv, e–i
- (3) a–ii, b–iii, c–i, d–iv, e–v
- (4) a–iii, b–v, c–i, d–iv, e–ii

120. Which of the following is the incorrect matching of three items and their grouping category ?

- (1) ER, Golgi body, lysosome – Endomembrane system
- (2) Chromoplast, chloroplast, leucoplast – Plastids
- (3) Amyloplast, elaioplast, aleuroplast – Leucoplast
- (4) Abrin, ricin, concanavalin – Toxins

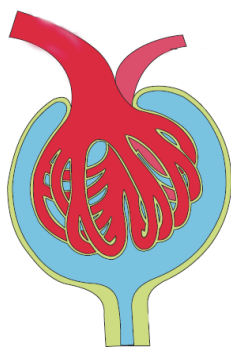
121. Non-cyclic photophosphorylation results in the formation of

- (1) ATP and $\text{NADH} + \text{H}^+$
- (2) ATP only
- (3) ATP and $\text{NADPH} + \text{H}^+$
- (4) ATP, ADP and $\text{NADH} + \text{H}^+$

122. Maintenance/regulation of water and electrolyte balance in our body is not influenced by

- (1) Thyroid hormones
- (2) Mineralocorticoids
- (3) Catecholamines
- (4) Vasopressin

123. Given figure represents



- (1) Glomerulus (2) Bowman's capsule
(3) Malpighian body (4) Renal capsule

124. Which of the following is incorrect matching ?

- (1) Pneumonia – Air borne disease
(2) Amoebiasis – Transmitted through contaminated food
(3) Chikungunya – Vector borne disease
(4) Common cold – Water borne disease

125. Which one of the following statements is incorrect?

- (1) Guava is a fleshy fruit.
(2) Mustard is a dry fruit.
(3) Cashew is a parthenocarpic fruit.
(4) Strawberry is a false fruit.

126. Which of the following is a characteristic feature of gymnosperms ?

- (1) The development of pollen grains take place within the microsporangia.
(2) Some gymnosperms are homosporous.
(3) The ovules are borne on megasporophylls which may be clustered to form the male cones.
(4) All of the above.

127. Match the columns I and II, and choose the correct combination from the options given.

Column I

- a. Ball and socket joint
b. Hinge joint
c. Pivot joint
d. Saddle joint

Column II

- i. Between carpal and metacarpal of thumb
ii. Between humerus and pectoral girdle
iii. Between atlas and axis
iv. Knee joint

- (1) a-iv, b-i, c-ii, d-iii
(2) a-ii, b-iv, c-iii, d-i
(3) a-iii, b-iv, c-i, d-ii
(4) a-iii, b-i, c-ii, d-iv

128. Which of the following acts as physiological barrier?

- (1) Natural killer cells
(2) Interferons
(3) Tears from eyes
(4) Mucus coating of the epithelial lining of urogenital tracts

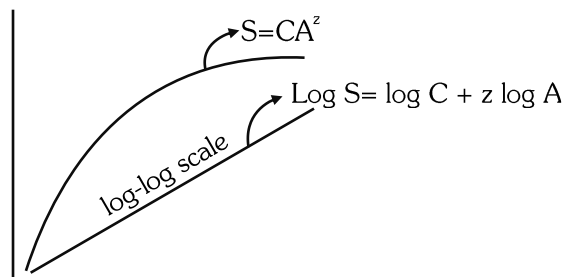
129. During secondary growth in dicot stem, cork cambium or phellogen usually develops in

- (1) Epidermal region
(2) Cortex region
(3) Pericycle region
(4) Pith region

130. The middle lamella is

- (1) A lignified layer which glues the neighbouring cells together.
(2) A membrane which connects cell membrane and cell wall.
(3) A structure which connects the cytoplasm of neighbouring cells.
(4) A layer which holds the different neighbouring cells together.

131. The following graph shows



- (1) Plant-animal relationship
(2) Algae-fungi relationship
(3) Species-volume relationship
(4) Species-area relationship

132. Single circulation is found in

- (1) *Neophron* (2) *Scoliodon*
(3) *Pteropus* (4) *Bufo*

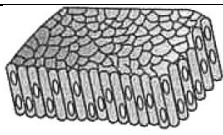

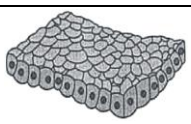
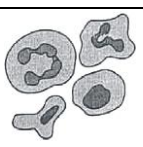
133. Inbreeding is an important strategy of animal breeding because it

- (1) is necessary to evolve a pure line in any animal
(2) helps in accumulation of superior genes
(3) helps in elimination of less desirable genes
(4) All of the above

134. During the period 1960 to 2000, wheat production was increased due to the development of semi-dwarf varieties of wheat, mainly due to the efforts of

- (1) M.S. Swaminathan
- (2) G.N. Ramaehandran
- (3) Panchanan Maheshwari
- (4) Norman E. Borlaug

135. Match the following and choose the correct combination.

	Column I (Figure)	Column II (Character)
a.		i. Component of connective tissue
b.		ii. Found in duct of glands
c.		iii. Secretion and absorption
d.		iv. Functioning cannot be directly controlled

- (1) a-ii, b-iii, c-i, d-iv (2) a-iii, b-iv, c-ii, d-i
 (3) a-iv, b-iii, c-ii, d-i (4) a-i, b-ii, c-iv, d-iii

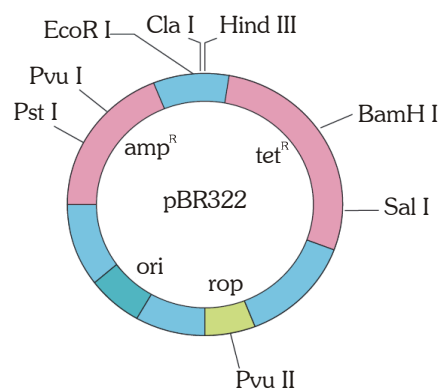
136. In glycolysis, ATP is synthesised during the conversion of

- (1) Glucose to glucose 6-phosphate
- (2) Fructose 6-phosphate to fructose 1, 6-bisphosphate
- (3) 1,3-bisphosphoglyceric acid to 3-phosphoglyceric acid
- (4) Both (2) and (3)

137. Which of the following plants are pollinated by water?

- (1) *Hydrilla*
- (2) *Zostera*
- (3) *Vallisneria*
- (4) All of the above

138. The following figure shows the representation of



- (1) Taq polymerase
- (2) Ti plasmid
- (3) Transformation
- (4) Vector

139. Common characters of all vertebrates without exception is

- (1) Two pairs of limbs
- (2) Exoskeleton
- (3) External ears and body hairs
- (4) Presence of vertebral column

140. The first recombinant DNA was constructed by linking an antibiotic resistant gene with native plasmid of

- (1) *Escherichia coli*
- (2) *Salmonella typhimurium*
- (3) *Bacillus thuringiensis*
- (4) *Rhizobium japonicum*

141. Select the correct statement about *Periplaneta*.

- (1) Grinding of food is carried out by gizzard and mandibles.
- (2) Six to eight hepatic caecae occurs at the junction of midgut and hindgut.
- (3) A pair of anal cerci are found only in males.
- (4) All of the above.

- 142.** Match column I with column II for mango classification and select the correct option using the codes given below.

Column I

- a. Division
b. Order
c. Family
d. Class

Column II

- i. Sapindales
ii. Anacardiaceae
iii. Dicotyledonae
iv. Angiospermae

- (1) a-ii, b-iii, c-iv, d-i
(2) a-iii, b-iv, c-i, d-ii
(3) a-iv, b-i, c-iii, d-ii
(4) a-iv, b-i, c-ii, d-iii

- 143.** How many equational divisions are required in a cell of human cheek to form 256 cells ?

- (1) 128 (2) 7 (3) 8 (4) 255

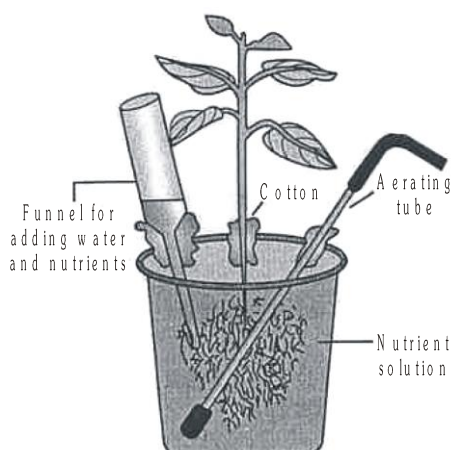
- 144.** Baculoviruses are employed as

- (1) Biogas production
(2) Bicontrol agents
(3) Sewage treatment agents
(4) Biofertiliser

- 145.** Which of the following is incorrectly matched pair?

- (1) Ethylene – Cousins
(2) Kinetin – Skoog and Miller
(3) Gibberellic acid – F.W. Went
(4) Auxin – Darwin and Darwin

- 146.** This setup is used for



- (1) Tissue culture
(2) Soilless culture
(3) Nutrient solution culture
(4) Both (2) and (3)

- 147.** The Ganga Action Plan and Yamuna Action Plan has initiated to save these rivers from pollution by the efforts of

- (1) The Ministry of Water Resources
(2) The Ministry of River Development
(3) The Ministry of Environment and Forests
(4) None of the above

- 148.** Product of asexual reproduction generally generates

- (1) Morphologically similar individuals
(2) Genetically similar individuals
(3) Offspring that are exact copies of their parent
(4) All of the above

- 149.** Pneumatic bones are present in

- (1) *Neophron* (2) *Ornithorynchus*
(3) *Testudo* (4) *Trygon*

- 150.** Match the columns I and II, and choose the correct combination from the options given.

Column I

- a. Inborn error of metabolism
b. Down's syndrome
c. Turner's syndrome
d. Sex linked recessive disorder

Column II

- i. Haemophilia
ii. Rudimentary ovaries
iii. Phenylketonuria
iv. Partially opened mouth

- (1) a-ii, b-iv, c-i, d-iii (2) a-iii, b-iv, c-ii, d-i
(3) a-i, b-iv, c-iii, d-ii (4) a-ii, b-iii, c-iv, d-i

- 151.** Pinnate, compound leaves with reticulate venation are present in

- (1) Neem (2) Mango
(3) *Alstonia* (4) Silk cotton

- 152.** The synaptonemal complex formed by a pair of synapsed homologous chromosomes is called

- (1) Bivalent
(2) Tetravalent
(3) Tetrad
(4) Both (1) and (3)

- 153.** Genetically modified organisms (GMO) have been useful in many ways. Which is incorrect about genetic modification?

- (1) They made crops more tolerant to drought.
(2) They enhance the nutritional value of food.
(3) They reduce the post harvest losses.
(4) They enhance reliance on chemical pesticides.

154. Find out the correct statement about figure.



- (1) It is the store house of collected dried plant specimens.
- (2) they have collection of preserved plant and animal specimens for study and reference.
- (3) They often have collections of skeletons of animals too.
- (4) They have collections of living plants for reference.

155. Which of the following pair of minerals is involved in the activation of enzymes of photosynthesis and respiration ?

- (1) Magnesium and manganese
- (2) Manganese and molybdenum
- (3) Molybdenum and magnesium
- (4) Manganese and chlorine

156. A single stranded DNA or RNA, tagged with a radioactive molecule is allowed to hybridise to its complementary DNA in a clone of cells followed by detection using

- (1) Polymerase chain reaction
- (2) Biolistic or gene gun
- (3) Autoradiography
- (4) DNA fingerprinting

157. Match the columns I and II, and choose the correct combination from the options given.

Column I

- a. Eukaryotes
- b. Translation
- c. Clover leaf model
- d. Prokaryotes
- (1) a–ii, b–i, c–iii, d–iv
- (3) a–ii, b–iv, c–iii, d–i

Column II

- i. tRNA
- ii. Polycistronic gene
- iii. Monocistronic gene
- iv. Ribosome
- (2) a–iii, b–iv, c–i, d–ii
- (4) a–i, b–ii, c–iii, d–iv

158. Choose the wrong statement regarding urine formation.

- (1) Henle's loop plays an important role in concentration of urine.
- (2) Protein-free fluid is filtered from blood plasma into the Bowman's capsule.
- (3) ADH helps in water elimination, making the urine hypotonic.
- (4) Filtration is a non-selective process performed by glomerulus

159. In the process of recombinant DNA technology, the bioreactors are used in

- (1) Downstream processing
- (2) Amplification of gene of interest
- (3) Separation of DNA fragments
- (4) Production of large quantities of culture

160. The part of the peripheral nervous system that comprises the whole complex of nerves, fibres, ganglia and plexuses by which impulses travel from the central nervous system to the viscera and from viscera to central nervous system is called

- (1) Autonomic nervous system
- (2) Sympathetic nervous system
- (3) Parasympathetic nervous system
- (4) Visceral nervous system

161. Hole seen in the cotton ball is due to



- (1) Corn borer
- (2) Bollworms
- (3) Army worm
- (4) *Bacillus thuringiensis*

162. In 13 major cities, Bharat stage-IV emission norms have been in place since April 2010, and it has been enforced for entire country since

- (1) April 2012
- (2) April 2014
- (3) April 2016
- (4) April 2017

163. In artificial hybridisation, which of the following phenomenon is not required for the female parent?

- (1) Emasculation
- (2) Bagging
- (3) Dusting of pollen grains (pollination)
- (4) Rebagging

164. Ribs are called bicephalic because it has two articulation surfaces on its

- (1) Dorsal end (2) Ventral end
- (3) Lateral end (4) Ventrolateral end

165. Match the columns I and II, and choose the correct combination from the options given.

Column I

- a. Pond
- b. Estuary
- c. Forest
- d. Crop field

Column II

- i. Man made ecosystem
- ii. Closed ecosystem
- iii. Aquatic ecosystem
- iv. Terrestrial ecosystem

- (1) a-iii, b-ii, c-iv, d-i (2) a-iv, b-i, c-ii, d-iii
- (3) a-iii, b-iii, c-iv, d-i (4) a-ii, b-iii, c-iv, d-i

166. Which of the following is an incorrect match ?

- (1) Doliolum – Urochordata – Subphylum
- (2) Scoliodon – Pisces – Super class
- (3) Bufo – Gnathostomata – Division
- (4) Lamprey – Agnatha – Class

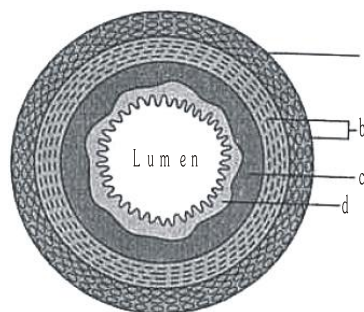
167. If a pond has 40 lotus plants last year and through reproduction 8 new plants are added, taking the current population to 48, what will be the birth rate?

- (1) 0.6 offspring per lotus per year
- (2) 0.5 offspring per lotus per year
- (3) 0.2 offspring per lotus per year
- (4) 0.1 offspring per lotus per year

168. Transport of water and mineral in higher plants takes place through

- (1) Sieve elements
- (2) Companion cells
- (3) Tracheids
- (4) Transfusion tissue

169. Which layer has goblet cells ?



- (1) a (2) b (3) c (4) d

170. Villi and rugae are the folds of which layer of alimentary canal ?

- (1) Serosa (2) Muscularis
- (3) Sub-mucosa (4) Mucosa

171. Which is incorrect statement about meiosis ?

- (1) Meiosis involves two sequential cycles of nuclear and cell division called meiosis I and meiosis II but only a single cycle of DNA replication.
- (2) Meiosis I is initiated after parental chromosome have replicated to produce sister chromatids at the S-phase.
- (3) Meiosis involves pairing of non-homologous chromosomes and recombination between them.
- (4) Four haploid cells are formed at the end of meiosis-II.

172. Loss of biodiversity in a region may lead to

- (1) Decline in plant production
- (2) Lowered resistance to drought
- (3) Increased variability in disease cycles
- (4) All of the above

173. Match the columns I and II, and choose the correct combination from the options given.

Column I

- a. Zeatin
- b. Differentiation
- c. Auxin
- d. Redifferentiation

Column II

- i. Tracheary element
- ii. Secondary xylem
- iii. Cytokinin
- iv. Indole

- (1) a-iii, b-i, c-ii, d-iv
- (2) a-iii, b-ii, c-i, d-iv
- (3) a-iii, b-i, c-iv, d-ii
- (4) a-iv, b-iii, c-ii, d-i

174. A plant receives 1000 J of energy from sun. The amount of energy will be present at the second trophic level is
(1) 1 J (2) 10 J (3) 100 J (4) 0.1 J

175. The cornea is the anterior portion of
(1) Choroid
(2) Sclera
(3) Retina
(4) Fovea

176. The thin membranous layer of the uterus is called
(1) Perimetrium
(2) Myometrium
(3) Endometrium
(4) Mesometrium

177. The following figure represents



- (1) Metaphase
(2) Transition to metaphase
(3) Anaphase
(4) Telophase

178. Which of the following is the most advanced stage during hydrarch succession ?

- (1) Reed-swamp stage
(2) Marsh-meadow stage
(3) Scrub stage
(4) Submerged plant stage

179. The anaerobic conditions for the nitrogenase enzymes has been provided by

- (1) Rhizobium bacteria
(2) Nitrate reductase
(3) Leguminous haemoglobin
(4) Glutamate dehydrogenase

180. Match the columns and find the correct combination.

**Column I
(Organism)**

- a. Earthworm
b. Human
c. Prawn
d. Insects

Column II

(Respiratory Organ)

- i. Pulmonary
ii. Branchial
iii. Tracheal
iv. Cutaneous

- (1) a-i, b-ii, c-iii, d-iv
(2) a-iv, b-i, c-ii, d-iii
(3) a-iii, b-ii, c-iv, d-i
(4) a-iv, b-ii, c-i, d-iii

ANSWER KEY

NEET(UG)-2021 (Paper-2)

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	3	2	3	2	4	4	4	2	2	1	2	4	2	2	2
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	3	2	3	3	4	2	4	4	B	1	2	1	1	2	4
Que.	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Ans.	2	2	3	3	1	1	3	2	3	3	2	3	2	4	4
Que.	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ans.	3	2	4	2	1	2	2	1	4	4	1	3	3	2	4
Que.	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Ans.	1	3	4	1	1	4	3	3	3	2	4	1	3	1	2
Que.	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
Ans.	1	1	3	2	2	3	3	2	1	1	4	1	4	2	4
Que.	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105
Ans.	4	3	2	2	2	3	4	1	3	2	4	4	1	3	4
Que.	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
Ans.	3	3	3	4	4	3	3	4	2	1	2	4	4	1	4
Que.	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135
Ans.	3	3	3	4	3	1	2	3	2	4	4	2	4	4	2
Que.	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
Ans.	3	4	4	4	2	1	4	3	3	3	4	3	4	1	2
Que.	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165
Ans.	1	4	4	1	1	3	2	3	4	4	2	4	1	1	4
Que.	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
Ans.	4	3	3	4	4	3	4	3	1	2	1	3	3	3	2

HINT - SHEET

1. For max. intensity

$$I_0 = A_1^2 + A_2^2 + 2A_1A_2 \cos \phi$$

$$I_0 = (2^2 + 3^2 + 2 \times 2 \times 3) A^2 = 25 A^2$$

$$\text{when path difference is } \frac{\lambda}{3} \{ \cos \phi = \cos 120^\circ = -\frac{1}{2} \}$$

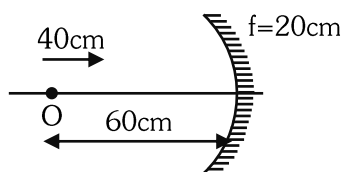
$$I = 2^2 + 3^2 + 2(2)(3) \left(-\frac{1}{2} \right) = 7A^2$$

$$\frac{I}{I_0} = \frac{7A^2}{25A^2} \Rightarrow I = \frac{7}{25} I_0$$

2. Angular width of central maxima

$$\theta_{\text{central}} = \frac{2\lambda}{d}$$

3.



$$\frac{dv}{dt} = -\frac{f^2}{(u-f)^2} \frac{du}{dt}$$

$$= -\frac{(-20)^2}{(-60+20)^2} (40) = -10 \text{ cm/s}$$

speed of image = 10 cm/s

4. Equivalent power of system

$$P_{\text{sys.}} = 2P_L + P_M$$

$$-\frac{1}{f_{\text{equivalent}}} = 2 \left(\frac{5}{3} - 1 \right) \left(\frac{1}{40} + \frac{1}{\infty} \right) + \frac{1}{\infty}$$

$$-\frac{f}{f_{\text{equi.}}} = \frac{1}{30}$$

$$f_{\text{equi.}} = -30 \text{ cm}$$

Since focal length is negative \Rightarrow Concave mirror

5. Resolving power of microscope

$$\text{R.P.} = \frac{2u \sin \theta}{\lambda} \propto \frac{1}{\lambda}$$

6. Output (x) is zero when both i/p A and B are either 0 or 1 so it is XOR gate.

7. For transistor

$$\beta = \frac{\alpha}{1-\alpha} = \frac{0.9}{1-0.9} = \frac{9}{1}$$

$$\beta = \frac{I_C}{I_B} = \frac{9}{1}$$

$$I_C = a \times (4\text{mA}) = 36\text{ mA}$$

9. $N = N_0 2^{-\frac{t}{T_{1/2}}}$

Taking log to the base 2

$$\frac{t}{T_{1/2}} = \log_2 \frac{N_0}{N}$$

$$\text{for 20\% decay } N = \frac{4}{5} N_0$$

$$\frac{t_1}{T_{1/2}} = \log_2 \frac{N_0}{\frac{4N_0}{5}} = \log_2 \frac{5}{4} \quad \dots (1)$$

$$\text{for 80\% decay } N = \frac{N_0}{5}$$

$$\frac{t_2}{T_{1/2}} = \log_2 \frac{N_0}{N_0/5} = \log_2 5 \quad \dots (2)$$

$$(2) - (1) \Rightarrow \frac{t_2 - t_1}{T_{1/2}} = \log_2 5 - (\log_2 5 - \log_2 4)$$

$$\frac{t_2 - t_1}{T_{1/2}} = \log_2 4 = 2$$

$$t_2 - t_1 = 2 \times T_{1/2} = 2 (5 \text{ min}) = 10 \text{ min.}$$

10. For He-atom, the energy levels are

$$K=6 \text{ ————— }$$

$$K=5 \text{ ————— } 13.6 \times \frac{2^2}{5^2} = 2.17\text{eV}$$

$$K=4 \text{ ————— } 13.6 \times \frac{2^2}{4^2} = 3.4\text{eV}$$

$$K=3 \text{ ————— } 13.6 \times \frac{2^2}{3^2} = 6.04\text{eV}$$

$$K=2 \text{ ————— } 13.6 \times \frac{2^2}{2^2} = 13.6\text{eV}$$

$$K=1 \text{ ————— } 13.6 \times 2^2 = 54.4\text{eV}$$

Only possibility of photon of 10.2 eV is from

$$K=4 \rightarrow K=2$$

$$\Rightarrow 4_n = 4$$

$$\Rightarrow n = 1$$

11. Let work function of metal surface be ϕ

when incident wavelength is λ

$$(K.E._{\text{max}})_1 = E - \phi \quad \dots (1)$$

when incident wavelength is $\frac{\lambda}{4}$

$$(K.E._{\text{max}})_2 = 4E - \phi \quad \dots (2)$$

from (1) & (2)

$$\frac{(K.E._{\text{max}})_2}{(K.E._{\text{max}})_1} = \frac{4E - \phi}{E - \phi} = \frac{4E - \phi - 3\phi + 3\phi}{E - \phi}$$

$$\frac{4(E - \phi) + 3\phi}{E - \phi} = 4 + \frac{3\phi}{E - \phi} > 4$$

12. For de-Broglie wavelength ' λ '

$$\lambda = \frac{h}{mV}$$

when both mass & velocity are changed

$$\lambda' = \frac{h}{(1.2)m \frac{V}{2}} = \frac{5}{3} \frac{h}{mV}$$

$$\frac{\lambda'}{\lambda} = \frac{5}{3} \Rightarrow \lambda' = \frac{5}{3} \lambda$$

13. Just after closing the switch, inductor will behave like open circuit.

$$\Rightarrow \text{Current through battery } i = \frac{E}{4R}$$

14. $\Delta q = \frac{\Delta \phi}{R} = \frac{20 - 10}{5} = 2 \text{ coulomb}$

15. Resistance of coil = $R = \frac{100}{1} 100\Omega$

$$\text{Inductance coil } L = \frac{\sqrt{3}}{\pi} H$$

when a.c. source is applied

$$i = \frac{V}{\sqrt{R^2 + (\omega L)^2}}$$

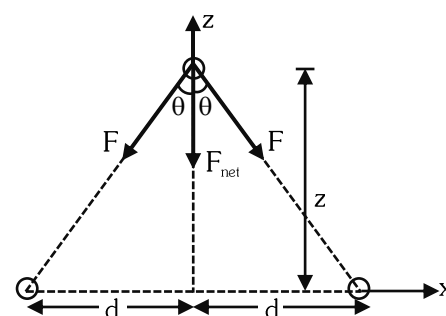
$$0.5 = \frac{100}{\sqrt{(100)^2 + (\omega L)^2}}$$

$$\omega L = 100 \sqrt{3}$$

$$(2\pi f) \frac{\sqrt{3}}{\pi} = 100 \sqrt{3} \Rightarrow f = 50 \text{ Hz}$$

16. $\chi_m \propto \frac{1}{T}$ (Curie's law)

- 17.

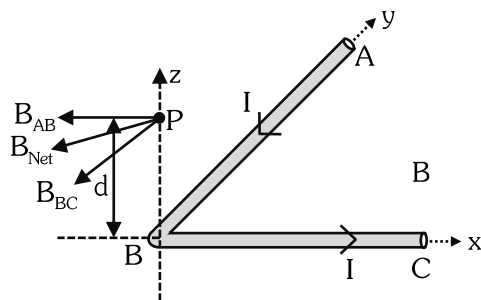


$$F = \frac{\mu_0 i^2}{2\pi \sqrt{d^2 + z^2}}$$

$$F_{\text{Net}} = 2F \cos \theta = 2 \frac{\mu_0 i^2}{2\pi \sqrt{d^2 + z^2}}$$

$$= \frac{z}{\sqrt{d^2 + z^2}} = \frac{\mu_0 i^2 z}{\pi (d^2 + z^2)}$$

18.



$$|\vec{B}_{AB}| = |\vec{B}_{BC}| = \frac{\mu_0 I}{4\pi d}$$

Net magnetic field at point P

$$B_{\text{Net}} = 2B \cos 45^\circ$$

$$= 2 \frac{\mu_0 I}{4\pi d} \times \frac{1}{\sqrt{2}} = \frac{\mu_0 I}{2\sqrt{2} \pi d}$$

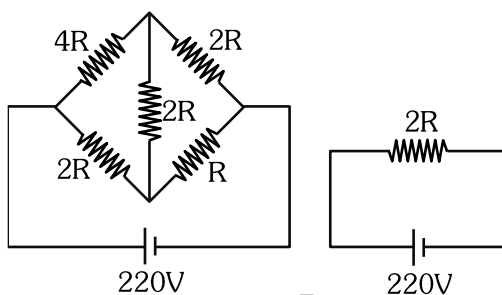
19. Let the resistance of 120W bulb is R

$$\text{then } R = \frac{(220)^2}{120}$$

then resistance of 60W bulb = 2R

& resistance of 30W bulb = 4R

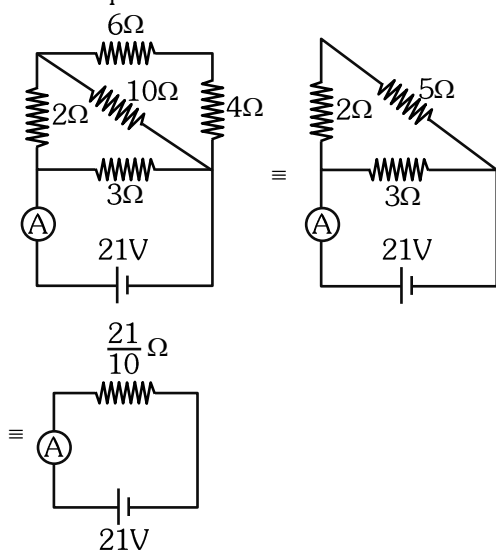
then equivalent circuit will be balanced what stone bridge.



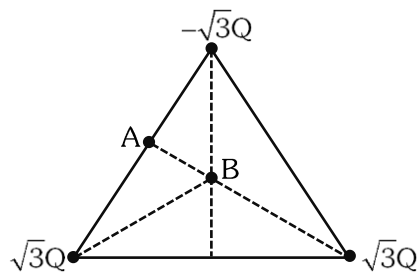
Total power consumed in circuit will be

$$= \frac{(220)^2}{2R} = \frac{(220)^2}{2 \times \frac{(220)^2}{120}} = 60W$$

20. Equivalent circuit :



23.



$$\text{Potential at pt. A } V_A = \frac{1}{4\pi\epsilon_0} \frac{\sqrt{3}Q}{\frac{\sqrt{3}L}{2}}$$

$$= 2 \left(\frac{1}{4\pi\epsilon_0} \frac{Q}{L} \right)$$

$$\text{Potential at pt. B } V_B = \frac{1}{4\pi\epsilon_0} \left(\frac{\sqrt{3}Q}{L/\sqrt{3}} \right) = 3 \frac{1}{4\pi\epsilon_0} \frac{Q}{L}$$

$$\text{W.D.} = q(V_B - V_A) = \frac{1}{4\pi\epsilon_0} \frac{Qq}{L}$$

26. Rate of loss of heat $\frac{dQ}{dt} = \sigma eA (T^4 - T_0^4)$

$$= (6 \times 10^{-8}) (0.5) (20 \times 10^{-4}) ((500)^4 - (300)^4) = 3.2 W$$

27. Volume of 10g of water = 10 cm³

$$\text{W.D.} = P\Delta V$$

$$= 10^5 [(11 - 10) \times 10^{-6}] = 0.1 J$$

28. Initially $f = \frac{1}{2\pi} \sqrt{\frac{k}{m}}$ When spring is cut & connected in parallel $K_{\text{eq}} = 4K$

$$\text{New frequency } f' = \frac{1}{2\pi} \sqrt{\frac{4K}{4m}} = f$$

29.

	A	B
Frequency	n_A	n_B
Tension	T	T
Length	2L	3L
Radii	3r	2r
Vibration	Fundamental	Second Overtone
n_A	$\frac{1}{2(2L)} \sqrt{\frac{T}{\rho\pi(3r)^2}}$	$n_B = \frac{3}{2(3L)} \sqrt{\frac{T}{\rho\pi(2r)^2}}$

$$\frac{n_A}{n_B} = \frac{1}{3}$$

30. For closed pipe frequencies will be,

$$= f_0, 3f_0, 5f_0, 7f_0$$

$$= 85, 255, 425, 595$$

32. When bubbles coalesce under isothermal conditions

$$P_1 V_1 + P_2 V_2 = P_f V_f$$

$$\left(\frac{4T}{r_1}\right)\left(\frac{4}{3}\pi r_1^3\right) + \left(\frac{4T}{r_2}\right)\left(\frac{4}{3}\pi r_2^3\right) = \left(\frac{4T}{r}\right)\left(\frac{4}{3}\pi r^3\right)$$

$$r_1^2 + r_2^2 = r^2$$

$$r = (r_1^2 + r_2^2)^{1/2}$$

33. Time taken to empty the full tank

$$t_1 = \frac{A}{a} \sqrt{\frac{2H}{g}}$$

Time taken to empty half-filled tank

$$t_2 = \frac{A}{a} \sqrt{\frac{2(H/2)}{g}}$$

$$\frac{t_1}{t_2} = \sqrt{2} \Rightarrow \frac{20\sqrt{2}}{t_2} = \sqrt{2}$$

$$\Rightarrow t_2 = 20 \text{ min.}$$

34. Angular momentum is conserved $L = \text{const.}$

$$L = I\omega$$

$$\text{if } I \downarrow \Rightarrow \omega \uparrow$$

$$\text{K.E.} = \frac{L^2}{2I} \quad \text{if } I \downarrow \Rightarrow \text{K.E.} \uparrow$$

35. $(M.I.)_{\text{sys.}} = \frac{ML^2}{3} \sin^2 45^\circ \times 4$

$$= \frac{ML^2}{3} \times \frac{1}{2} \times 4$$

$$= \frac{2}{3} ML^2$$

36. $\Delta H = \frac{1}{2} \frac{m_1 m_2}{m_1 + m_2} (u_1 - u_2)^2 (1 - e^2)$

$$\text{for energy loss in collision } \Delta H = \left(\frac{1}{2} m u^2\right) \frac{1}{2}$$

$$m_1 = m, m_2 = 2m, u_1 = u, u_2 = 0$$

$$\frac{1}{2} \left(\frac{1}{2} m u^2\right) = \frac{1}{2} \frac{(m)(2m)}{3m} (u - 0)^2 (1 - e^2)$$

$$\frac{1}{2} = \frac{2}{3} (1 - e^2)$$

$$1 - e^2 = \frac{3}{4}$$

$$e^2 = \frac{1}{4}$$

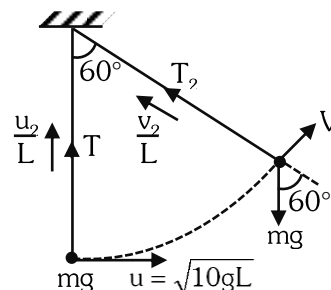
$$e = \frac{1}{2}$$

37. At lowest position

$$T_1 - mg = m \left(\frac{u^2}{L}\right)$$

$$T_1 - mg = m(10g)$$

$$T_1 = 11mg \quad \dots (1)$$



At 60° to vertical

$$T_2 - mg \cos 60^\circ = m \left(\frac{v^2}{L}\right)$$

$$T_2 = \frac{mg}{2} + \frac{mv^2}{L} \quad \dots (2)$$

Using conservation of energy

$$\frac{1}{2} m (u^2 - v^2) = mg L \cos 60^\circ$$

$$u^2 - v^2 = 2gL \left(\frac{1}{2}\right)$$

$$\log L - v^2 = 2L$$

$$v = \sqrt{9gL} \quad \dots (3)$$

from (2) & (3)

$$T_2 = \frac{mg}{2} + m(9g) = \frac{19}{2} mg \quad \dots (4)$$

from (1) & (4)

$$\frac{T_2}{T_1} = \frac{19}{22}$$

38. At highest point of trajectory angle between velocity & gravitational force is 90° .

$$P = |\vec{F}| |\vec{v}| \cos 90^\circ = 0$$

39. W.D. = Area under the curve ABC

$$= \left\{ \frac{\pi}{2} (d)(F_0) \right\} + (2F_0)(2d)$$

$$= F_0 d \left(\frac{\pi}{2} + 4 \right)$$

40. Friction \propto Normal force

$$N_A = mg$$

$$N_B = mg - F \sin \theta$$

$$N_C = mg + F \sin \theta$$

$$\text{Since } N_C > N_A > N_B$$

$$\Rightarrow f_C > f_A > f_B$$

41. Tension at pt. P = $\left[m + \frac{2L}{3} (3m) \right]_{\text{geff.}}$

$$= 3m_{\text{geff.}} = 3m \left(g + \frac{g}{3} \right) = 4mg$$

43. $v = \frac{a}{x^2}$

$$\frac{dx}{dt} = \frac{a}{x^2}$$

$$\int_0^x x^2 dx = a \int_0^t dt$$

$$\frac{x^3}{3} = at$$

$$x = (3at)^{1/3}$$

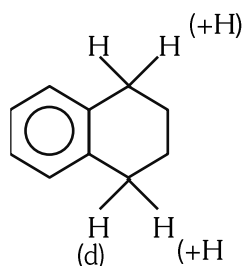
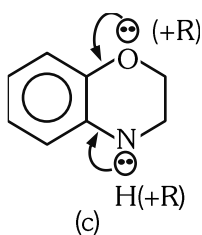
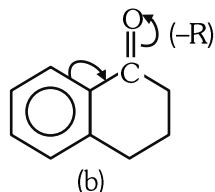
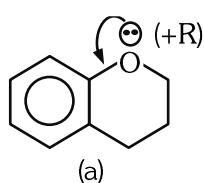
45. Area of parallelogram = $|\vec{a} \times \vec{b}|$

$$= |(3\hat{i} + 4\hat{j} + 5\hat{k}) \times (\hat{i} - \hat{j} - \hat{k})|$$

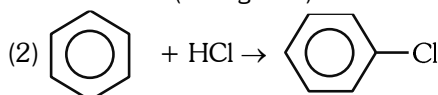
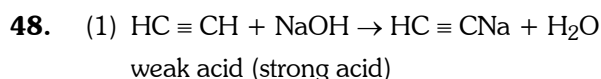
$$= |\hat{i} + 8\hat{j} - 7\hat{k}| = \sqrt{1^2 + 8^2 + (-7)^2} = \sqrt{114}$$

46. $\left. \begin{array}{l} \text{C } 54.5/12 = 4.5 \\ \text{H } 9.1/1 \\ \text{O } \frac{36.4}{16} = 2.3 \end{array} \right\} \text{C}_2\text{H}_4\text{O}$

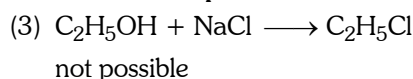
47. Reactivity towards electrophilic aromatic substitution reaction (ESR) \propto density in ring.



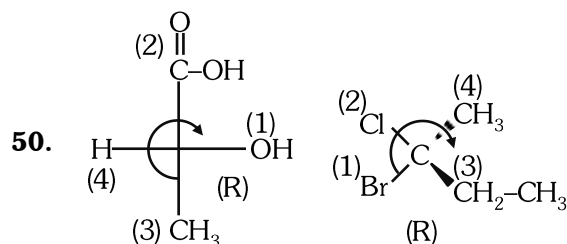
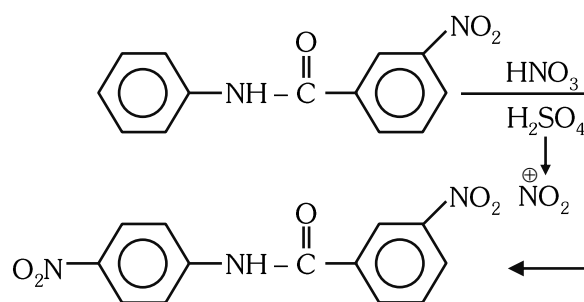
(2) $c > a > d > b$



Reaction not possible



49.

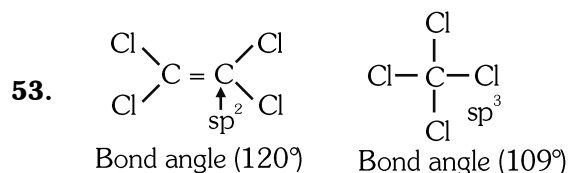


51. $\frac{0.32}{E} = \frac{112}{11200}$
 $E = 32$

52. 18 mL contains 6.02×10^{23} molecules
1 mL contains $\frac{6.02 \times 10^{23}}{18}$

Number of molecule in one drop

$$= \frac{6.02 \times 10^{23}}{18 \times 20} = 1.67 \times 10^{21}$$

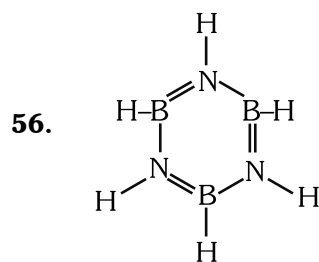


54. eq of Ag = eq of O₂

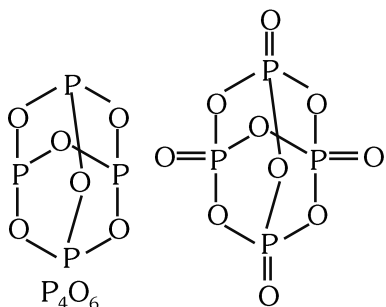
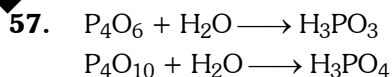
$$\frac{W}{108} = \frac{1.6}{8}$$

$$w = 21.60 \text{ g}$$

55. $4 \times 1.6 \times 10^{-19} = \frac{6.6 \times 10^{-34} \times 3 \times 10^8}{\lambda}$
 $\lambda = 3100 \text{ \AA}$ (Approximately)

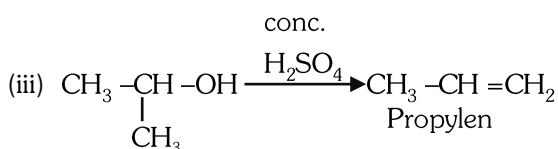
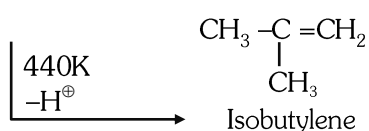
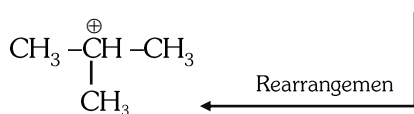
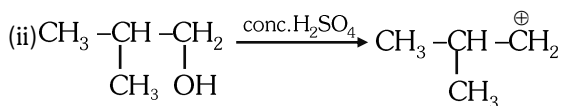
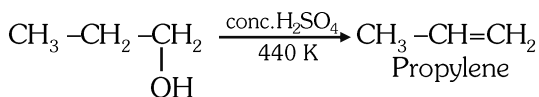


$$12\sigma, 3\pi$$

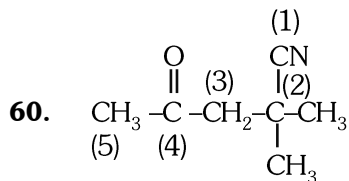
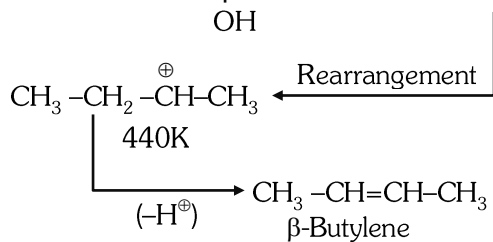
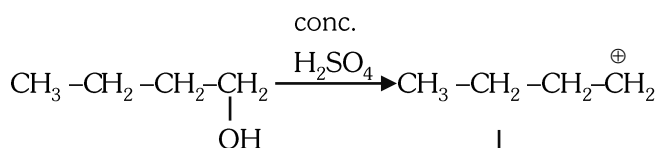


58. Acidic H_2O_2 is stable in acidic medium.
 H_2O_2 can act as both oxidising and reducing agent.
 μ of $H_2O_2 \neq 0$

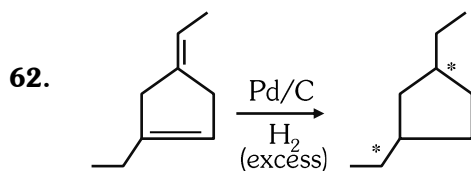
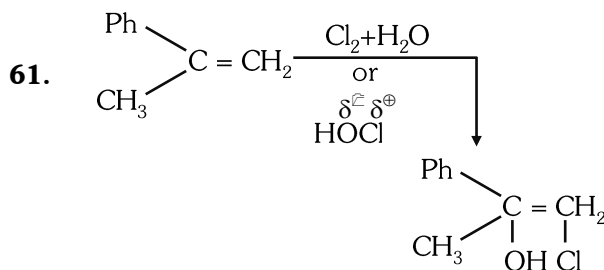
59. (i)



(iv)



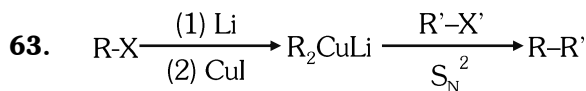
2,2-Dimethyl-4-oxopentanenitrile



Number of chiral C = 2

$$\text{Number of stereoisomers} = 2^{n-1} + 2^{\frac{n}{2}-1}$$

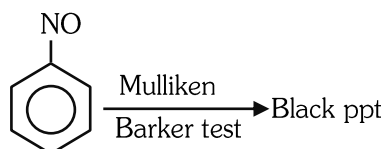
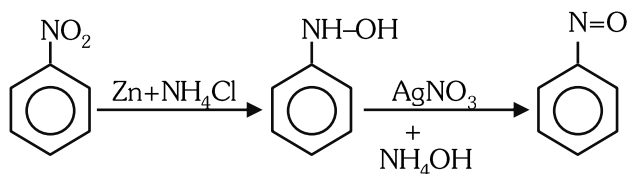
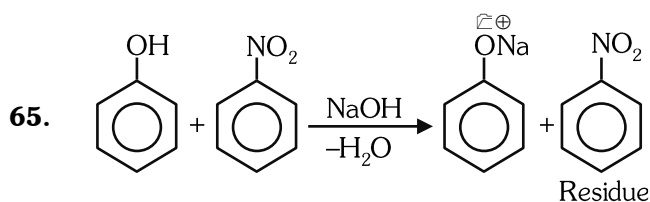
$$= 2^{2-1} + 2^{\frac{2}{2}-1} = 2^1 + 2^0 = 3$$



3° R-X cannot be used.

64. Cubic system : SC, BCC, FCC

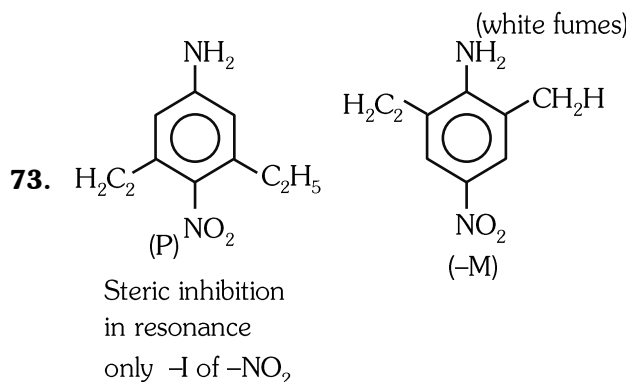
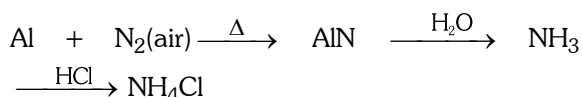
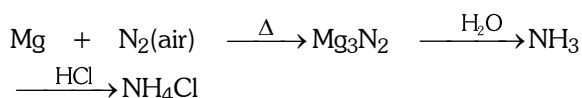
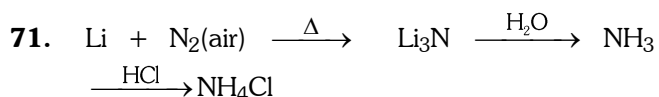
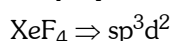
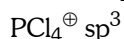
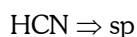
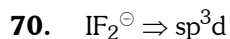
$H_2O \rightarrow$ Diamagnetic and weakly repelled



$$67. \quad M = \frac{k \times 1000}{\wedge_m} = \frac{k + 1000}{x + y} \text{ mol/L}$$

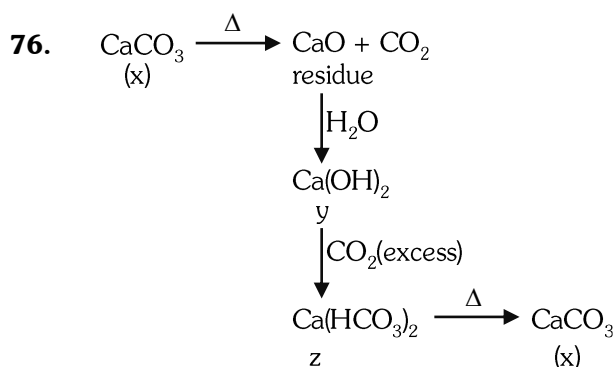
$$= \frac{k \times 1000}{x + y} \times 188 \text{ g/L}$$

68. Fact



74. Size of P is larger :-

P-O bond length is maximum.

75. Terminal alkynes give white precipitate with ammonical AgNO_3 .

77. $Q_{\text{sp}} = [\text{Ag}^+][\text{I}^-] = (0.01)(0.015) = 1.5 \times 10^{-4}$

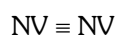
$K_{\text{sp}} = 8.5 \times 10^{-7}$

$Q_{\text{sp}} > K_{\text{sp}}$

78. $T = \frac{\Delta H}{\Delta S} = \frac{-49000}{-40.2} = 1219 \text{ K}$

$\equiv (1219 - 273) = 946^\circ \text{C}$

$\Delta G = \Delta H - T\Delta S = -H + T\Delta S$

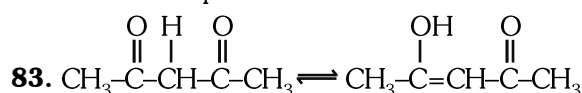
when $T > 1219 \text{ K}$ then $\Delta G = +ve$ 

$1 \times 0.1 \times 200 = 1 \times 0.5 \times V$

$V = 40 \text{ mL}$

80. Exhaust fumes of car has CO . CO is a poisonous gas.

81. A is diatomic, B is monoatomic.

82. NaF maximum ionic \therefore max. mp.

Most acidic H

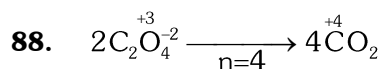
Most enolic form

84. SiF_6^{2-} is known (existing) due to small size of F(\therefore less steric hinderence)

1	1	0
1-0.8	1-0.8	1.6

$K_C = \frac{1.6 \times 1.6}{0.2 \times 0.2} = 64$

86. $T = \frac{\Delta H}{\Delta S} = \frac{-30000}{-100} = 300 \text{ K} = 27^\circ \text{C}$



$\frac{W}{40} = \frac{2 \times 0.5 \times 10}{1000}$

$W = 0.4 \text{ g}$

90. Number of atoms

$= \text{mole} \times N_A \times \text{atomicity}$

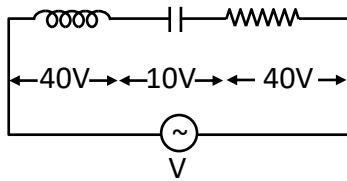
$= 1.4 \times 6.02 \times 10^{23} \times 4 = 3.372 \times 10^{24}$

NEET(UG) – 2021

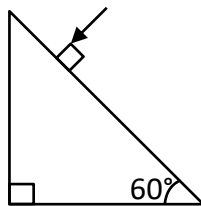
Section-A (Physics)

1. An inductor of inductance L , a capacitor of capacitance C and a resistor of resistance ' R ' are connected in series to an ac source of potential difference ' V ' volts as shown in figure.

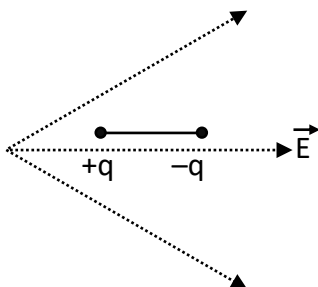
Potential difference across L , C and R is 40 V, 10 V and 40 V, respectively. The amplitude of current flowing through LCR series circuit is $10\sqrt{2}$ A. The impedance of the circuit is :-



- (1) $4\sqrt{2}\Omega$ (2) $5/\sqrt{2}\Omega$
(3) 4Ω (4) 5Ω
2. Find the value of the angle of emergence from the prism. Refractive index of the glass is $\sqrt{3}$.



- (1) 60° (2) 30° (3) 45° (4) 90°
3. A dipole is placed in an electric field as shown. In which direction will it move ?



- (1) towards the left as its potential energy will increase.
(2) towards the right as its potential energy will decrease.
(3) towards the left as its potential energy will decrease.
(4) towards the right as its potential energy will increase.

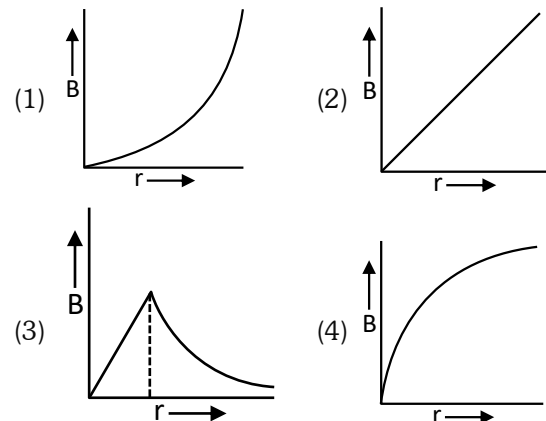
4. A capacitor of capacitance ' C ', is connected across an ac source of voltage V , given by $V = V_0 \sin \omega t$

The displacement current between the plates of the capacitor, would then be given by :

(1) $I_d = V_0 \omega C \cos \omega t$ (2) $I_d = \frac{V_0}{\omega C} \cos \omega t$

(3) $I_d = \frac{V_0}{\omega C} \sin \omega t$ (4) $I_d = V_0 \omega C \sin \omega t$

5. A thick current carrying cable of radius ' R ' carries current ' I ' uniformly distributed across its cross-section. The variation of magnetic field $B(r)$ due to the cable with the distance ' r ' from the axis of the cable is represented by :



6. A convex lens ' A ' of focal length 20 cm and a concave lens ' B ' of focal length 5 cm are kept along the same axis with a distance ' d ' between them. If a parallel beam of light falling on ' A ' leaves ' B ' as a parallel beam, then the distance ' d ' in cm will be :-

- (1) 25 (2) 15
(3) 50 (4) 30

7. An electromagnetic wave of wavelength ' λ ' is incident on a photosensitive surface of negligible work function. If ' m ' mass is of photoelectron emitted from the surface has de-Broglie wavelength λ_d , then :

(1) $\lambda = \left(\frac{2m}{hc} \right) \lambda_d^2$ (2) $\lambda_d = \left(\frac{2mc}{h} \right) \lambda^2$

(3) $\lambda = \left(\frac{2mc}{h} \right) \lambda_d^2$ (4) $\lambda = \left(\frac{2h}{mc} \right) \lambda_d^2$

8. **Column-I** gives certain physical terms associated with flow of current through a metallic conductor. **Column-II** gives some mathematical relations involving electrical quantities. Match **Column-I** and **Column-II** with appropriate relations.

Column-I		Column-II	
(A)	Drift Velocity	(P)	$\frac{m}{ne^2\rho}$
(B)	Electrical Resistivity	(Q)	nev_d
(C)	Relaxation Period	(R)	$\frac{eE}{m}\tau$
(D)	Current Density	(S)	$\frac{E}{J}$

- (1) (A)-(R), (B)-(S), (C)-(P), (D)-(Q)
 (2) (A)-(R), (B)-(S), (C)-(Q), (D)-(P)
 (3) (A)-(R), (B)-(P), (C)-(S), (D)-(Q)
 (4) (A)-(R), (B)-(Q), (C)-(S), (D)-(P)
9. A radioactive nucleus A_ZX undergoes spontaneous decay in the sequence ${}^A_ZX \rightarrow {}^{A-1}_{Z-1}B \rightarrow {}^{A-3}_{Z-3}C \rightarrow {}^{A-2}_{Z-2}D$, where Z is the atomic number of element X . The possible decay particles in the sequence are :
- (1) α, β^-, β^+ (2) α, β^+, β^-
 (3) β^+, α, β^- (4) β^-, α, β^+
10. The effective resistance of a parallel connection that consists of four wires of equal length, equal area of cross-section and same material is 0.25Ω . What will be the effective resistance if they are connected in series ?
- (1) 0.25Ω (2) 0.5Ω
 (3) 1Ω (4) 4Ω
11. A particle is released from height S from the surface of the Earth. At a certain height its kinetic energy is three times its potential energy. The height from the surface of earth and the speed of the particle at that instant are respectively :

- (1) $\frac{S}{4}, \frac{3gS}{2}$ (2) $\frac{S}{4}, \frac{\sqrt{3gS}}{2}$
 (3) $\frac{S}{2}, \frac{\sqrt{3gS}}{2}$ (4) $\frac{S}{4}, \sqrt{\frac{3gS}{2}}$

12. The half-life of a radioactive nuclide is 100 hours. The fraction of original activity that will remain after 150 hours would be :

- (1) $1/2$ (2) $\frac{1}{2\sqrt{2}}$
 (3) $\frac{2}{3}$ (4) $\frac{2}{3\sqrt{2}}$

13. A cup of coffee cools from 90°C to 80°C in t minutes, when the room temperature is 20°C . The time taken by a similar cup of coffee to cool from 80°C to 60°C at a room temperature same at 20°C is :

- (1) $\frac{13}{10}t$ (2) $\frac{13}{5}t$
 (3) $\frac{10}{13}t$ (4) $\frac{5}{13}t$

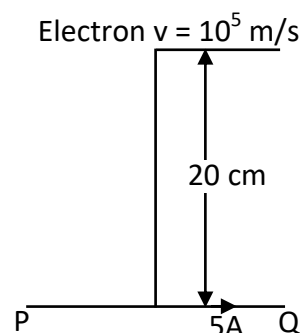
14. The number of photons per second on an average emitted by the source of monochromatic light of wavelength 600 nm , when it delivers the power of $3.3 \times 10^{-3} \text{ watt}$ will be :

- ($h = 6.6 \times 10^{-34} \text{ Js}$)
 (1) 10^{18} (2) 10^{17}
 (3) 10^{16} (4) 10^{15}

15. A body is executing simple harmonic motion with frequency ' n ', the frequency of its potential energy is :-

- (1) n (2) $2n$ (3) $3n$ (4) $4n$

16. An infinitely long straight conductor carries a current of 5 A as shown. An electron is moving with a speed of 10^5 m/s parallel to the conductor. The perpendicular distance between the electron and the conductor is 20 cm at an instant. Calculate the magnitude of the force experienced by the electron at that instant.



- (1) $4 \times 10^{-20} \text{ N}$ (2) $8\pi \times 10^{-20} \text{ N}$
 (3) $4\pi \times 10^{-20} \text{ N}$ (4) $8 \times 10^{-20} \text{ N}$

17. If force [F], acceleration [A] and time [T] are chosen as the fundamental physical quantities. Find the dimensions of energy.

- (1) [F] [A] [T] (2) [F] [A] [T]²
(3) [F] [A] [T]⁻¹ (4) [F] [A⁻¹] [T]

18. Match **Column-I** and **Column-II** and choose the **correct** match from the given choices.

Column-I		Column-II	
(A)	Root mean square speed of gas molecules	(P)	$\frac{1}{3}nm\bar{v}^2$
(B)	Pressure exerted by ideal gas	(Q)	$\sqrt{\frac{3RT}{M}}$
(C)	Average kinetic energy of a molecule	(R)	$\frac{5}{2}RT$
(D)	Total internal energy of 1 mole of a diatomic gas	(S)	$\frac{3}{2}k_B T$

- (1) (A) - (R), (B) - (P), (C) - (S), (D) - (Q)
(2) (A) - (Q), (B) - (R), (C) - (S), (D) - (P)
(3) (A) - (Q), (B) - (P), (C) - (S), (D) - (R)
(4) (A) - (R), (B) - (Q), (C) - (P), (D) - (S)

19. A small block slides down on a smooth inclined plane, starting from rest at time $t = 0$. Let S_n be the distance travelled by the block in the interval

$t = n - 1$ to $t = n$. Then, the ratio $\frac{S_n}{S_{n+1}}$ is :

- (1) $\frac{2n-1}{2n}$ (2) $\frac{2n-1}{2n+1}$
(3) $\frac{2n+1}{2n-1}$ (4) $\frac{2n}{2n-1}$

20. A nucleus with mass number 240 breaks into two fragments each of mass number 120, the binding energy per nucleon of unfragmented nuclei is 7.6 MeV while that of fragments is 8.5 MeV. The total gain in the Binding Energy in the process is :

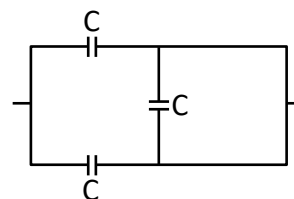
- (1) 0.9 MeV
(2) 9.4 MeV
(3) 804 MeV
(4) 216 MeV

21. A screw gauge gives the following readings when used to measure the diameter of a wire
Main scale reading : 0 mm
Circular scale reading : 52 divisions

Given that 1 mm on main scale corresponds to 100 divisions on the circular scale. The diameter of the wire from the above data is :

- (1) 0.52 cm (2) 0.026 cm
(3) 0.26 cm (4) 0.052 cm

22. The equivalent capacitance of the combination shown in the figure is :



- (1) 3C (2) 2C (3) C/2 (4) 3C/2

23. A lens of large focal length and large aperture is best suited as an objective of an astronomical telescope since :

- (1) a large aperture contributes to the quality and visibility of the images.
(2) a large area of the objective ensures better light gathering power.
(3) a large aperture provides a better resolution.
(4) all of the above.

24. Two charged spherical conductors of radius R_1 and R_2 are connected by a wire. Then the ratio of surface charge densities of the spheres (σ_1/σ_2) is:

- (1) $\frac{R_1}{R_2}$ (2) $\frac{R_2}{R_1}$
(3) $\sqrt{\frac{R_1}{R_2}}$ (4) $\frac{R_1^2}{R_2^2}$

25. A spring is stretched by 5 cm by a force 10 N. The time period of the oscillations when a mass of 2 kg is suspended by it is :

- (1) 0.0628 s (2) 6.28 s
(3) 3.14 s (4) 0.628 s

26. For a plane electromagnetic wave propagating in x-direction, which one of the following combination gives the correct possible directions for electric field (E) and magnetic field (B) respectively?

- (1) $\hat{j} + \hat{k}, \hat{j} + \hat{k}$ (2) $-\hat{j} + \hat{k}, -\hat{j} - \hat{k}$
(3) $\hat{j} + \hat{k}, -\hat{j} - \hat{k}$ (4) $-\hat{j} + \hat{k}, -\hat{j} + \hat{k}$

27. The escape velocity from the Earth's surface is v . The escape velocity from the surface of another planet having a radius, four times that of Earth and same mass density is:
- (1) v (2) $2v$
(3) $3v$ (4) $4v$
28. In a potentiometer circuit a cell of EMF 1.5 V gives balance point at 36 cm length of wire. If another cell of EMF 2.5 V replaces the first cell, then at what length of the wire, the balance point occurs?
- (1) 60 cm (2) 21.6 cm
(3) 64 cm (4) 62 cm
29. The velocity of a small ball of mass M and density d , when dropped in a container filled with glycerine becomes constant after some time. If the density of glycerine is $\frac{d}{2}$, then the viscous force acting on the ball will be :
- (1) $\frac{Mg}{2}$ (2) Mg
(3) $\frac{3}{2}Mg$ (4) $2Mg$
30. A parallel plate capacitor has a uniform electric field ' E ' in the space between the plates. If the distance between the plates is ' d ' and the area of each plate is ' A ', the energy stored in the capacitor is : (ϵ_0 = permittivity of free space)
- (1) $\frac{1}{2}\epsilon_0 E^2$ (2) $\epsilon_0 EAd$
(3) $\frac{1}{2}\epsilon_0 E^2 Ad$ (4) $\frac{E^2 Ad}{\epsilon_0}$
31. The electron concentration in an n-type semiconductor is the same as hole concentration in a p-type semiconductor. An external field (electric) is applied across each of them. Compare the currents in them.
- (1) current in n-type = current in p-type
(2) current in p-type > current in n-type
(3) current in n-type > current in p-type
(4) No current will flow in p-type, current will only flow in n-type
32. Consider the following **statements (A) and (B)** and identify the **correct** answer.
- (A) A zener diode is connected in reverse bias, when used as a voltage regulator.
(B) The potential barrier of p-n junction lies between 0.1 V to 0.3 V.
- (1) (A) and (B) both are correct.
(2) (A) and (B) both are incorrect.
(3) (A) is correct and (B) is incorrect.
(4) (A) is incorrect but (B) is correct.
33. Polar molecules are the molecules :
- (1) having zero dipole moment.
(2) acquire a dipole moment only in the presence of electric field due to displacement of charges.
(3) acquire a dipole moment only when magnetic field is absent.
(4) having a permanent electric dipole moment.
34. If E and G respectively denote energy and gravitational constant, then $\frac{E}{G}$ has the dimensions of :
- (1) $[M^2] [L^{-1}] [T^0]$
(2) $[M] [L^{-1}] [T^{-1}]$
(3) $[M] [L^0] [T^0]$
(4) $[M^2] [L^{-2}] [T^{-1}]$
35. Water falls from a height of 60 m at the rate of 15 kg/s to operate a turbine. The losses due to frictional force are 10% of the input energy. How much power is generated by the turbine?
- ($g = 10 \text{ m/s}^2$)
- (1) 10.2 kW
(2) 8.1 kW
(3) 12.3 kW
(4) 7.0 kW

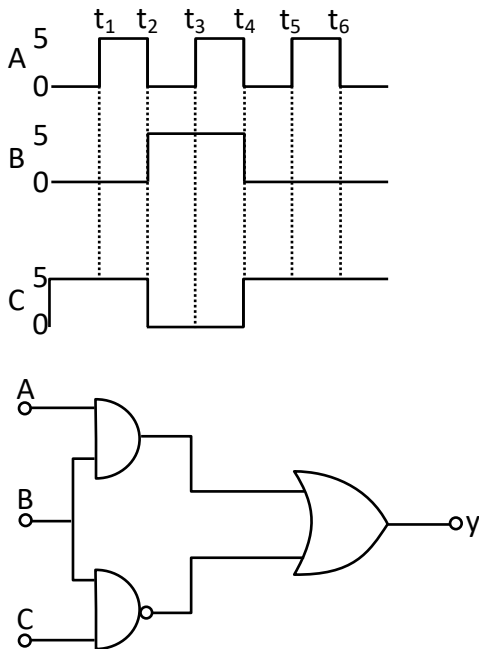
Section-B (Physics)

36. A car starts from rest and accelerates at 5 m/s^2 . At $t = 4 \text{ s}$, a ball is dropped out of a window by a person sitting in the car. What is the velocity and acceleration of the ball at $t = 6 \text{ s}$?

(Take $g = 10 \text{ m/s}^2$)

- (1) 20 m/s , 5 m/s^2 (2) 20 m/s , 0
(3) $20\sqrt{2} \text{ m/s}$, 0 (4) $20\sqrt{2} \text{ m/s}$, 10 m/s^2

37. For the given circuit, the input digital signals are applied at the terminals A, B and C. What would be the output at the terminal y?

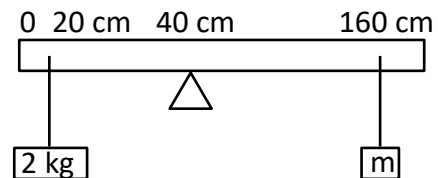


- (1) 0 V
(2) 5 V
(3) 5 V
(4) 5 V

38. A ball of mass 0.15 kg is dropped from a height 10 m , strikes the ground and rebounds to the same height. The magnitude of impulse imparted to the ball is ($g = 10 \text{ m/s}^2$) nearly :

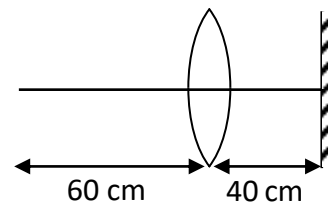
- (1) 0 kg m/s
(2) 4.2 kg m/s
(3) 2.1 kg m/s
(4) 1.4 kg m/s

39. A uniform rod of length 200 cm and mass 500 g is balanced on a wedge placed at 40 cm mark. A mass of 2 kg is suspended from the rod at 20 cm and another unknown mass ' m ' is suspended from the rod at 160 cm mark as shown in the figure. Find the value of ' m ' such that the rod is in equilibrium. ($g = 10 \text{ m/s}^2$)



- (1) $\frac{1}{2} \text{ kg}$ (2) $\frac{1}{3} \text{ kg}$ (3) $\frac{1}{6} \text{ kg}$ (4) $\frac{1}{12} \text{ kg}$

40. A point object is placed at a distance of 60 cm from a convex lens of focal length 30 cm . If a plane mirror were put perpendicular to the principal axis of the lens and at a distance of 40 cm from it, the final image would be formed at a distance of :

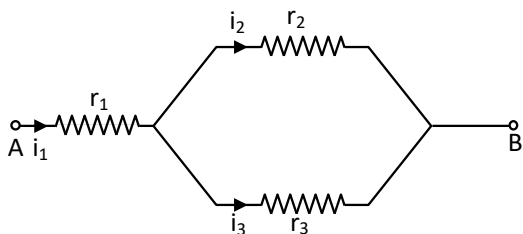


- (1) 20 cm from the lens, it would be a real image.
(2) 30 cm from the lens, it would be a real image.
(3) 30 cm from the plane mirror, it would be a virtual image.
(4) 20 cm from the plane mirror, it would be a virtual image.

41. A step down transformer connected to an ac mains supply of 220 V is made to operate at 11 V , 44 W lamp. Ignoring power losses in the transformer, what is the current in the primary circuit?

- (1) 0.2 A (2) 0.4 A
(3) 2 A (4) 4 A

42. Three resistors having resistances r_1 , r_2 and r_3 are connected as shown in the given circuit. The ratio $\frac{i_3}{i_1}$ of currents in terms of resistances used in the circuit is :



- (1) $\frac{r_1}{r_2 + r_3}$ (2) $\frac{r_2}{r_2 + r_3}$
 (3) $\frac{r_1}{r_1 + r_2}$ (4) $\frac{r_2}{r_1 + r_3}$
43. In the product $\vec{F} = q(\vec{v} \times \vec{B})$
 $= q\vec{v} \times (\vec{B}_i + \vec{B}_j + \vec{B}_k)$
 For $q = 1$ and $\vec{v} = 2\hat{i} + 4\hat{j} + 6\hat{k}$ and $\vec{F} = 4\hat{i} - 20\hat{j} + 12\hat{k}$
 What will be the complete expression for \vec{B} ?
 (1) $-8\hat{i} - 8\hat{j} - 6\hat{k}$ (2) $-6\hat{i} - 6\hat{j} - 8\hat{k}$
 (3) $8\hat{i} + 8\hat{j} - 6\hat{k}$ (4) $6\hat{i} + 6\hat{j} - 8\hat{k}$
44. A particle of mass 'm' is projected with a velocity $v = kV_e$ ($k < 1$) from the surface of the earth.
 (V_e = escape velocity)
 The maximum height above the surface reached by the particle is :
 (1) $R\left(\frac{k}{1-k}\right)^2$ (2) $R\left(\frac{k}{1+k}\right)^2$
 (3) $\frac{R^2 k}{1+k}$ (4) $\frac{Rk^2}{1-k^2}$
45. Twenty seven drops of same size are charged at 220 V each. They combine to form a bigger drop. Calculate the potential of the bigger drop.
 (1) 660 V (2) 1320 V
 (3) 1520 V (4) 1980 V

46. A series LCR circuit containing 5.0 H inductor, $80 \mu\text{F}$ capacitor and 40Ω resistor is connected to 230 V variable frequency ac source. The angular frequencies of the source at which power transferred to the circuit is half the power at the resonant angular frequency are likely to be :
 (1) 25 rad/s and 75 rad/s
 (2) 50 rad/s and 25 rad/s
 (3) 46 rad/s and 54 rad/s
 (4) 42 rad/s and 58 rad/s
47. A uniform conducting wire of length $12a$ and resistance 'R' is wound up as a current carrying coil in the shape of,
 (i) an equilateral triangle of side 'a'.
 (ii) a square of side 'a'.
 The magnetic dipole moments of the coil in each case respectively are:
 (1) $\sqrt{3} Ia^2$ and $3 Ia^2$ (2) $3 Ia^2$ and Ia^2
 (3) $3 Ia^2$ and $4 Ia^2$ (4) $4 Ia^2$ and $3 Ia^2$
48. From a circular ring of mass 'M' and radius 'R' an arc corresponding to a 90° sector is removed. The moment of inertia of the remaining part of the ring about an axis passing through the centre of the ring and perpendicular to the plane of the ring is 'K' times ' MR^2 '. Then the value of 'K' is :
 (1) $\frac{3}{4}$ (2) $\frac{7}{8}$ (3) $\frac{1}{4}$ (4) $\frac{1}{8}$
49. Two conducting circular loops of radii R_1 and R_2 are placed in the same plane with their centres coinciding. If $R_1 \gg R_2$, the mutual inductance M between them will be directly proportional to:
 (1) $\frac{R_1}{R_2}$ (2) $\frac{R_2}{R_1}$ (3) $\frac{R_1^2}{R_2}$ (4) $\frac{R_2^2}{R_1}$
50. A particle moving in a circle of radius R with a uniform speed takes a time T to complete one revolution. If this particle were projected with the same speed at an angle ' θ ' to the horizontal, the maximum height attained by it equals 4R. The angle of projection, θ , is then given by :
 (1) $\theta = \cos^{-1}\left(\frac{gT^2}{\pi^2 R}\right)^{1/2}$ (2) $\theta = \cos^{-1}\left(\frac{\pi^2 R}{gT^2}\right)^{1/2}$
 (3) $\theta = \sin^{-1}\left(\frac{\pi^2 R}{gT^2}\right)^{1/2}$ (4) $\theta = \sin^{-1}\left(\frac{2gT^2}{\pi^2 R}\right)^{1/2}$

Section-A (Chemistry)

51. Given below are two statements:

Statement I :

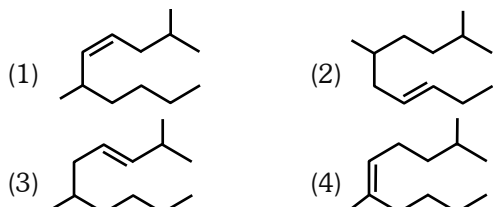
Aspirin and Paracetamol belong to the class of narcotic analgesics.

Statement II :

Morphine and Heroin are non-narcotic analgesics. In the light of the above statements, choose the **correct** answer from the options given below.

- (1) Both **Statement I** and **Statement II** are true.
- (2) Both **Statement I** and **Statement II** are false.
- (3) **Statement I** is correct but **Statement II** is false.
- (4) **Statement I** is incorrect but **Statement II** is true.

52. The correct structure of 2,6-Dimethyl-dec-4-ene is:



53. BF_3 is planar and electron deficient compound.

Hybridization and number of electrons around the central atom, respectively are:

- (1) sp^3 and 4
- (2) sp^3 and 6
- (3) sp^2 and 6
- (4) sp^2 and 8

54. Noble gases are named because of their inertness towards reactivity. Identify an **incorrect** statement about them.

- (1) Noble gases are sparingly soluble in water.
- (2) Noble gases have very high melting and boiling points.
- (3) Noble gases have weak dispersion forces.
- (4) Noble gases have large positive values of electron gain enthalpy.

55. The molar conductance of NaCl , HCl and CH_3COONa at infinite dilution are 126.45, 426.16 and $91.0 \text{ S cm}^2 \text{ mol}^{-1}$ respectively. The molar conductance of CH_3COOH at infinite dilution is.

Choose the right option for your answer.

- (1) $201.28 \text{ S cm}^2 \text{ mol}^{-1}$
- (2) $390.71 \text{ S cm}^2 \text{ mol}^{-1}$
- (3) $698.28 \text{ S cm}^2 \text{ mol}^{-1}$
- (4) $540.48 \text{ S cm}^2 \text{ mol}^{-1}$

56. The right option for the statement "Tyndall effect is exhibited by", is :

- (1) NaCl solution
- (2) Glucose solution
- (3) Starch solution
- (4) Urea solution

57. The RBC deficiency is deficiency disease of:

- (1) Vitamin B_{12}
- (2) Vitamin B_6
- (3) Vitamin B_1
- (4) Vitamin B_2

58. Dihedral angle of least stable conformer of ethane is :

- (1) 120°
- (2) 180°
- (3) 60°
- (4) 0°

59. The **incorrect** statement among the following is:

- (1) Actinoid contraction is greater for element to element than Lanthanoid contraction.
- (2) Most of the trivalent Lanthanoid ions are colorless in the solid state.
- (3) Lanthanoids are good conductors of heat and electricity.
- (4) Actinoids are highly reactive metals, especially when finely divided.

60. The major product formed in dehydrohalogenation reaction of 2-Bromo pentane is Pent-2-ene. This product formation is based on ?

- (1) Saytzeff's Rule
- (2) Hund's Rule
- (3) Hoffmann Rule
- (4) Huckel's Rule

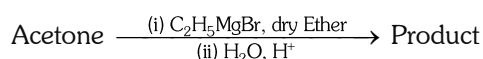
61. Which one among the following is the correct option for right relationship between C_P and C_V for one mole of ideal gas ?

- (1) $C_P + C_V = R$
- (2) $C_P - C_V = R$
- (3) $C_P = RC_V$
- (4) $C_V = RC_P$

62. Which one of the following polymers is prepared by addition polymerisation ?

- (1) Teflon
- (2) Nylon-66
- (3) Novolac
- (4) Dacron

63. What is the IUPAC name of the organic compound formed in the following chemical reaction ?



- (1) 2-methyl propan-2-ol
- (2) pentan-2-ol
- (3) pentan-3-ol
- (4) 2-methyl butan-2-ol

64. Match **List - I** with **List - II**.

List-I	List-II
(a) PCl_5	(i) Square pyramidal
(b) SF_6	(ii) Trigonal planar
(c) BrF_5	(iii) Octahedral
(d) BF_3	(iv) Trigonal bipyramidal

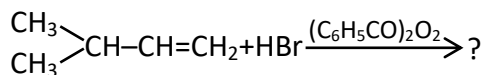
Choose the **correct** answer from the options given below.

- (1) (a)-(iv), (b)-(iii), (c)-(i), (d)-(ii)
 (2) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)
 (3) (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii)
 (4) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)

65. Which one of the following methods can be used to obtain highly pure metal which is liquid at room temperature ?

- (1) Electrolysis
 (2) Chromatography
 (3) Distillation
 (4) Zone refining

66. The major product of the following chemical reaction is:



- (1) $\text{CH}_3 \begin{array}{c} \diagup \\ \text{CH} \\ \diagdown \end{array} \text{CH}-\text{CH}_2-\text{CH}_2-\text{Br}$
 (2) $\text{CH}_3 \begin{array}{c} \diagup \\ \text{CH} \\ \diagdown \end{array} \text{CH}-\text{CH}_2-\text{CH}_2-\text{O}-\text{COC}_6\text{H}_5$
 (3) $\text{CH}_3 \begin{array}{c} \diagup \\ \text{CH} \\ \diagdown \end{array} \text{CH}-\underset{\text{Br}}{\text{CH}}-\text{CH}_3$
 (4) $\text{CH}_3 \begin{array}{c} \diagup \\ \text{CH} \\ \diagdown \end{array} \text{CBr}-\text{CH}_2-\text{CH}_3$

67. Tritium, a radioactive isotope of hydrogen, emits which of the following particles ?

- (1) Beta (β^-)
 (2) Alpha (α)
 (3) Gamma (γ)
 (4) Neutron (n)

68. The correct sequence of bond enthalpy of 'C-X' bond is

- (1) $\text{CH}_3-\text{F} < \text{CH}_3-\text{Cl} < \text{CH}_3-\text{Br} < \text{CH}_3-\text{I}$
 (2) $\text{CH}_3-\text{F} > \text{CH}_3-\text{Cl} > \text{CH}_3-\text{Br} > \text{CH}_3-\text{I}$
 (3) $\text{CH}_3-\text{F} < \text{CH}_3-\text{Cl} > \text{CH}_3-\text{Br} > \text{CH}_3-\text{I}$
 (4) $\text{CH}_3-\text{Cl} > \text{CH}_3-\text{F} > \text{CH}_3-\text{Br} > \text{CH}_3-\text{I}$

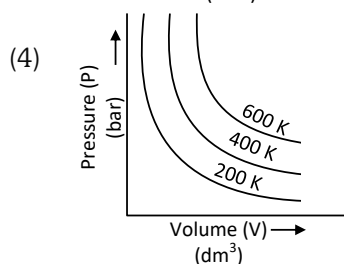
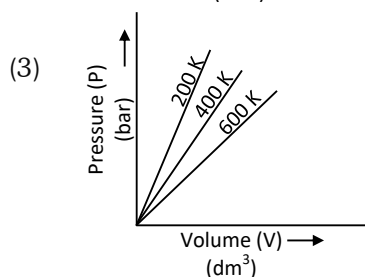
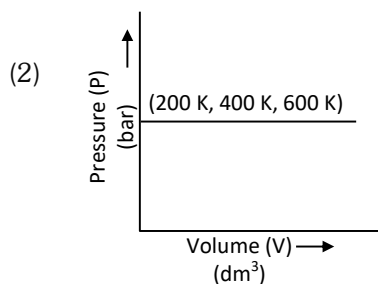
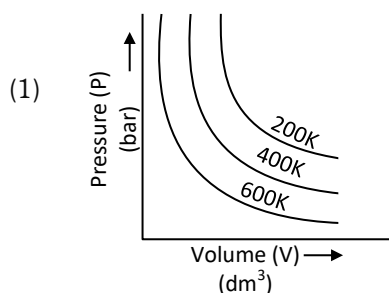
69. Right option for the number of tetrahedral and octahedral voids in hexagonal primitive unit cell are:

- (1) 8, 4
 (2) 6, 12
 (3) 2, 1
 (4) 12, 6

70. Which of the following reactions is the metal displacement reaction ? Choose the right option.

- (1) $2\text{KClO}_3 \xrightarrow{\Delta} 2\text{KCl} + 3\text{O}_2$
 (2) $\text{Cr}_2\text{O}_3 + 2\text{Al} \xrightarrow{\Delta} \text{Al}_2\text{O}_3 + 2\text{Cr}$
 (3) $\text{Fe} + 2\text{HCl} \rightarrow \text{FeCl}_2 + \text{H}_2\uparrow$
 (4) $2\text{Pb}(\text{NO}_3)_2 \rightarrow 2\text{PbO} + 4\text{NO}_2 + \text{O}_2\uparrow$

71. Choose the correct option for graphical representation of Boyle's law, which shows a graph of pressure vs. volume of a gas at different temperatures:



72. The pK_b of dimethylamine and pK_a of acetic acid are 3.27 and 4.77 respectively at T (K). The correct option for the pH of dimethylammonium acetate solution is:

- (1) 8.50 (2) 5.50
(3) 7.75 (4) 6.25

73. Among the following alkaline earth metal halides, one which is covalent and soluble in organic solvents is:

- (1) Calcium chloride
(2) Strontium chloride
(3) Magnesium chloride
(4) Beryllium chloride

74. The maximum temperature that can be achieved in blast furnace is :

- (1) upto 1200 K
(2) upto 2200 K
(3) upto 1900 K
(4) upto 5000 K

75. Ethylene diaminetetraacetate (EDTA) ion is:

- (1) Hexadentate ligand with four "O" and two "N" donor atoms
(2) Unidentate ligand
(3) Bidentate ligand with two "N" donor atoms
(4) Tridentate ligand with three "N" donor atoms

76. The following solutions were prepared by dissolving 10 g of glucose ($C_6H_{12}O_6$) in 250 ml of water (P_1), 10 g of urea (CH_4N_2O) in 250 ml of water (P_2) and 10 g of sucrose ($C_{12}H_{22}O_{11}$) in 250 ml of water (P_3). The right option for the decreasing order of osmotic pressure of these solutions is :

- (1) $P_2 > P_1 > P_3$
(2) $P_1 > P_2 > P_3$
(3) $P_2 > P_3 > P_1$
(4) $P_3 > P_1 > P_2$

77. **Statement I :**

Acid strength increases in the order given as $HF \ll HCl \ll HBr \ll HI$.

Statement II :

As the size of the elements F, Cl, Br, I increases down the group, the bond strength of HF, HCl, HBr and HI decreases and so the acid strength increases.

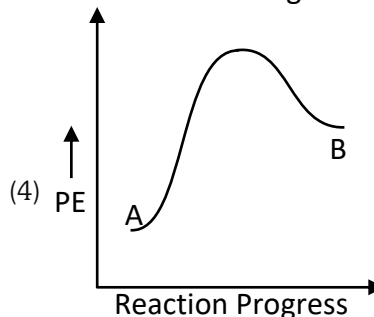
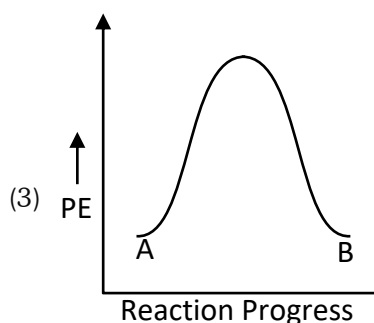
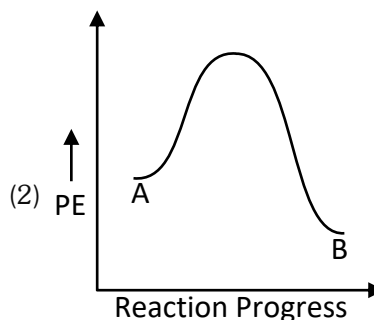
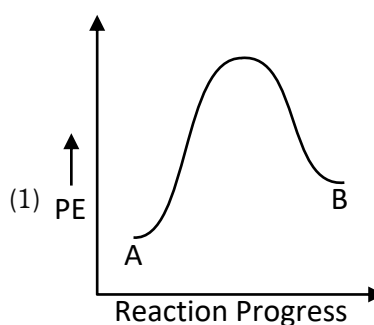
In the light of the above statements, choose the **correct** answer from the options given below.

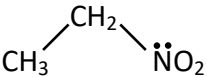
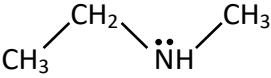
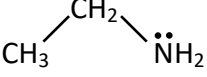
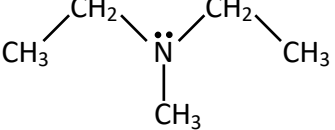
- (1) Both **Statement I** and **Statement II** are true.
(2) Both **Statement I** and **Statement II** are false.
(3) **Statement I** is correct but **Statement II** is false.
(4) **Statement I** is incorrect but **Statement II** is true.

78. The structures of beryllium chloride in solid state and vapour phase, are:

- (1) Chain and dimer, respectively
(2) Linear in both
(3) Dimer and Linear, respectively
(4) Chain in both

79. For a reaction $A \rightarrow B$, enthalpy of reaction is -4.2 kJ mol^{-1} and enthalpy of activation is 9.6 kJ mol^{-1} . The correct potential energy profile for the reaction is shown in option.



80. Zr ($Z = 40$) and Hf ($Z = 72$) have similar atomic and ionic radii because of :
 (1) belonging to same group
 (2) diagonal relationship
 (3) lanthanoid contraction
 (4) having similar chemical properties
81. A particular station of All India Radio, New Delhi, broadcasts on a frequency of 1,368 kHz (kilohertz). The wavelength of the electromagnetic radiation emitted by the transmitter is :
 [speed of light $c = 3.0 \times 10^8 \text{ ms}^{-1}$]
 (1) 219.3 m (2) 219.2 m
 (3) 2192 m (4) 21.92 cm
82. An organic compound contains 78% (by wt.) carbon and remaining percentage of hydrogen. The right option for the empirical formula of this compound is [Atomic wt. of C is 12, H is 1]
 (1) CH (2) CH₂
 (3) CH₃ (4) CH₄
83. The compound which shows metamerism is:
 (1) C₅H₁₂ (2) C₃H₈O
 (3) C₃H₆O (4) C₄H₁₀O
84. Identify the compound that will react with Hinsberg's reagent to give a solid which dissolves in alkali :
 (1) 
 (2) 
 (3) 
 (4) 
85. The correct option for the number of body centred unit cells in all 14 types of Bravais lattice unit cells is :
 (1) 7 (2) 5
 (3) 2 (4) 3

SECTION-B (CHEMISTRY)

86. Match List-I with List-II

List-I		List-II	
(a)	[Fe(CN) ₆] ³⁻	(i)	5.92 BM
(b)	[Fe(H ₂ O) ₆] ³⁺	(ii)	0 BM
(c)	[Fe(CN) ₆] ⁴⁻	(iii)	4.90 BM
(d)	[Fe(H ₂ O) ₆] ²⁺	(iv)	1.73 BM

Choose the **correct** answer from the options given below

- (1) (a)-(iv), (b)-(ii), (c)-(i), (d)-(iii)
 (2) (a)-(ii), (b)-(iv), (c)-(iii), (d)-(i)
 (3) (a)-(i), (b)-(iii), (c)-(iv), (d)-(ii)
 (4) (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)
87. Choose the correct option for the total pressure (in atm.) in a mixture of 4 g O₂ and 2 g H₂ confined in a total volume of one litre at 0°C is:
 [Given $R = 0.082 \text{ L atm mol}^{-1} \text{ K}^{-1}$, $T = 273 \text{ K}$]
 (1) 2.518 (2) 2.602
 (3) 25.18 (4) 26.02
88. $\text{CH}_3\text{CH}_2\text{COO}^-\text{Na}^+ \xrightarrow[\text{Heat}]{\text{NaOH, +?}} \text{CH}_3\text{CH}_3 + \text{Na}_2\text{CO}_3$
 Consider the above reaction and identify the missing reagent/chemical.
 (1) B₂H₆ (2) Red Phosphorus
 (3) CaO (4) DIBAL-H
89. For irreversible expansion of an ideal gas under isothermal condition, the correct option is :
 (1) $\Delta U = 0$, $\Delta S_{\text{total}} = 0$
 (2) $\Delta U \neq 0$, $\Delta S_{\text{total}} \neq 0$
 (3) $\Delta U = 0$, $\Delta S_{\text{total}} \neq 0$
 (4) $\Delta U \neq 0$, $\Delta S_{\text{total}} = 0$

90. In which one of the following arrangements the given sequence is not strictly according to the properties indicated against it ?

- (1) $\text{HF} < \text{HCl} < \text{HBr} < \text{HI}$: Increasing acidic strength
(2) $\text{H}_2\text{O} < \text{H}_2\text{S} < \text{H}_2\text{Se} < \text{H}_2\text{Te}$: Increasing pK_a values
(3) $\text{NH}_3 < \text{PH}_3 < \text{AsH}_3 < \text{SbH}_3$: Increasing acidic character
(4) $\text{CO}_2 < \text{SiO}_2 < \text{SnO}_2 < \text{PbO}_2$: Increasing oxidizing power

91. The molar conductivity of 0.007 M acetic acid is $20 \text{ S cm}^2 \text{ mol}^{-1}$. What is the dissociation constant of acetic acid ? Choose the correct option.

$$\left[\begin{array}{l} \Lambda_{\text{H}^+}^\circ = 350 \text{ S cm}^2 \text{ mol}^{-1} \\ \Lambda_{\text{CH}_3\text{COO}^-}^\circ = 50 \text{ S cm}^2 \text{ mol}^{-1} \end{array} \right]$$

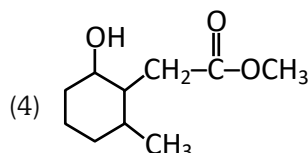
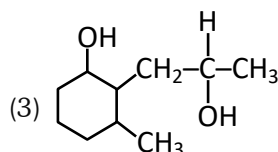
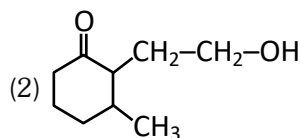
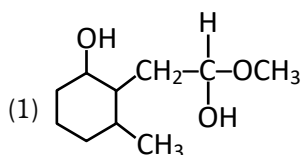
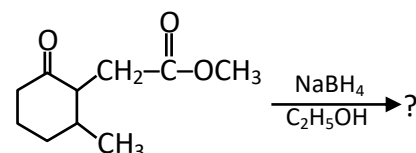
- (1) $1.75 \times 10^{-4} \text{ mol L}^{-1}$
(2) $2.50 \times 10^{-4} \text{ mol L}^{-1}$
(3) $1.75 \times 10^{-5} \text{ mol L}^{-1}$
(4) $2.50 \times 10^{-5} \text{ mol L}^{-1}$

92. The slope of Arrhenius Plot $\left(\ln k \text{ v/s } \frac{1}{T} \right)$ of first order reaction is $-5 \times 10^3 \text{ K}$. The value of E_a of the reaction is. Choose the correct option for your answer.

$$[\text{Given } R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}]$$

- (1) 41.5 kJ mol^{-1} (2) 83.0 kJ mol^{-1}
(3) 166 kJ mol^{-1} (4) -83 kJ mol^{-1}

93. The product formed in the following chemical reaction is



94. Match List-I with List-II.

List-I	List-II
(a) $\xrightarrow[\text{Anhyd. AlCl}_3/\text{CuCl}]{\text{CO, HCl}}$	(i) Hell-Volhard-Zelinsky reaction
(b) $\text{R}-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_3 + \text{NaOX} \longrightarrow$	(ii) Gattermann-Koch Reaction
(c) $\text{R}-\text{CH}_2-\text{OH} + \text{R}'\text{COOH} \xrightarrow{\text{Conc. H}_2\text{SO}_4}$	(iii) Haloform reaction
(d) $\text{R}-\text{CH}_2-\text{COOH} \xrightarrow[\text{(ii) H}_2\text{O}]{\text{(i) X}_2/\text{Red P}}$	(iv) Esterification

Choose the **correct** answer from the options given below.

- (1) (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)
(2) (a)-(iii), (b)-(ii), (c)-(i), (d)-(iv)
(3) (a)-(i), (b)-(iv), (c)-(iii), (d)-(ii)
(4) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)

95. Which of the following molecules is non-polar in nature ?

- (1) POCl_3
(2) CH_2O
(3) SbCl_5
(4) NO_2

96. From the following pairs of ions which one is not an iso-electronic pair ?

- (1) O^{2-} , F^-
- (2) Na^+ , Mg^{2+}
- (3) Mn^{2+} , Fe^{3+}
- (4) Fe^{2+} , Mn^{2+}

97. The correct option for the value of vapour pressure of a solution at $45^\circ C$ with benzene to octane in molar ratio 3 : 2 is :

[At $45^\circ C$ vapour pressure of benzene is 280 mm Hg and that of octane is 420 mm Hg.

Assume Ideal gas]

- (1) 160 mm of Hg
- (2) 168 mm of Hg
- (3) 336 mm of Hg
- (4) 350 mm of Hg

98. Match **List-I** with **List-II** :

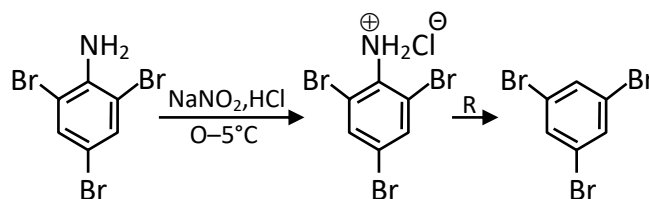
List-I**List-II**

- | | |
|---|-----------------------------|
| (a) $2SO_2(g) + O_2(g) \rightarrow 2SO_3(g)$ | (i) Acid rain |
| (b) $HOCl(g) \xrightarrow{h\nu} \dot{OH} + \dot{Cl}$ | (ii) Smog |
| (c) $CaCO_3 + H_2SO_4 \rightarrow CaSO_4 + H_2O + CO_2$ | (iii) Ozone depletion |
| (d) $NO_2(g) \xrightarrow{h\nu} NO(g) + O(g)$ | (iv) Tropospheric pollution |

Choose the **correct** answer from the options given below.

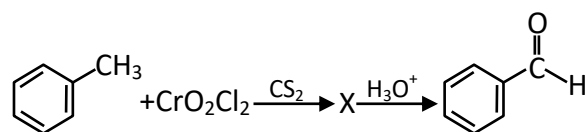
- (1) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)
- (2) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)
- (3) (a)-(iv), (b)-(iii), (c)-(i), (d)-(ii)
- (4) (a)-(iii), (b)-(ii), (c)-(iv), (d)-(i)

99. The reagent 'R' in the given sequence of chemical reaction is :



- (1) H_2O
- (2) CH_3CH_2OH
- (3) HI
- (4) $CuCN/KCN$

100. The intermediate compound 'X' in the following chemical reaction is :



- (1) $\text{C}_6\text{H}_5\text{CH(OCrOHCl}_2)_2$
- (2) $\text{C}_6\text{H}_5\text{CH(OCOCH}_3)_2$
- (3) $\text{C}_6\text{H}_5\text{CHCl}_2$
- (4) $\text{C}_6\text{H}_5\text{CH}_2\text{Cl}$

Section-A (Biology : Botany)

- 101.** Inspite of interspecific competition in nature, which mechanism the competing species might have evolved for their survival ?

- (1) Resource partitioning
- (2) Competitive release
- (3) Mutualism
- (4) Predation

- 102.** Match **List - I** with **List - II**.

List - I		List - II	
(a)	Cells with active cell division capacity	(i)	Vascular tissues
(b)	Tissue having all cells similar in structure and function	(ii)	Meristematic tissue
(c)	Tissue having different types of cells	(iii)	Sclereids
(d)	Dead cells with highly thickened walls and narrow lumen	(iv)	Simple tissue

Select the **correct** answer from the options given below.

- | | | | |
|------------|------------|------------|------------|
| (a) | (b) | (c) | (d) |
| (1) (ii) | (iv) | (i) | (iii) |
| (2) (iv) | (iii) | (ii) | (i) |
| (3) (i) | (ii) | (iii) | (iv) |
| (4) (iii) | (ii) | (iv) | (i) |

- 103.** During the purification process for recombinant DNA technology, addition of chilled ethanol precipitates out:

- (1) RNA
- (2) DNA
- (3) Histones
- (4) Polysaccharides

- 104.** Match **List - I** with **List - II**.

List - I		List - II	
(a)	Cohesion	(i)	More attraction in liquid phase
(b)	Adhesion	(ii)	Mutual attraction among water molecules
(c)	Surface tension	(iii)	Water loss in liquid phase
(d)	Guttation	(iv)	Attraction towards polar surfaces

Choose the **correct** answer from the options given below.

- | | | | |
|------------|------------|------------|------------|
| (a) | (b) | (c) | (d) |
| (1) (ii) | (iv) | (i) | (iii) |
| (2) (iv) | (iii) | (ii) | (i) |
| (3) (iii) | (i) | (iv) | (ii) |
| (4) (ii) | (i) | (iv) | (iii) |

- 105.** The term used for transfer of pollen grains from anthers of one plant to stigma of a different plant which, during pollination, brings genetically different types of pollen grains to stigma, is :

- (1) Xenogamy
- (2) Geitonogamy
- (3) Chasmogamy
- (4) Cleistogamy

- 106.** Which of the following stages of meiosis involves division of centromere ?

- (1) Metaphase I
- (2) Metaphase II
- (3) Anaphase II
- (4) Telophase II

- 107.** Which of the following is a **correct** sequence of steps in a PCR (Polymerase Chain Reaction) ?

- (1) Denaturation, Annealing, Extension
- (2) Denaturation, Extension, Annealing
- (3) Extension, Denaturation, Annealing
- (4) Annealing, Denaturation, Extension

- 108.** Gemmae are present in :

- (1) Mosses
- (2) Pteridophytes
- (3) Some Gymnosperms
- (4) Some Liverworts

- 109.** The production of gametes by the parents, formation of zygotes, the F_1 and F_2 plants, can be understood from a diagram called :

- (1) Bullet square
- (2) Punch square
- (3) Punnett square
- (4) Net square

- 110.** The factor that leads to Founder effect in a population is:

- (1) Natural selection
- (2) Genetic recombination
- (3) Mutation
- (4) Genetic drift

111. Genera like *Selaginella* and *Salvinia* produce two kinds of spores. Such plants are known as :

- (1) Homosorus (2) Heterosorus
(3) Homosporous (4) Heterosporous

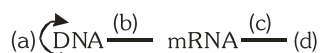
112. Plants follow different pathways in response to environment or phases of life to form different kinds of structures. This ability is called :

- (1) Elasticity (2) Flexibility
(3) Plasticity (4) Maturity

113. Which of the following are **not** secondary metabolites in plants ?

- (1) Morphine, codeine
(2) Amino acids, glucose
(3) Vinblastin, curcumin
(4) Rubber, gums

114. Complete the flow chart on central dogma.



- (1) (a)-Replication; (b)-Transcription;
(c)-Transduction; (d)-Protein
(2) (a)-Translation; (b)-Replication;
(c)-Transcription; (d)-Transduction
(3) (a)-Replication; (b)-Transcription;
(c)-Translation; (d)-Protein
(4) (a)-Transduction; (b)-Translation;
(c)-Replication; (d)-Protein

115. When the centromere is situated in the middle of two equal arms of chromosomes, the chromosome is referred as :

- (1) Metacentric (2) Telocentric
(3) Sub-metacentric
(4) Acrocentric

116. DNA strands on a gel stained with ethidium bromide when viewed under UV radiation, appear as :

- (1) Yellow bands
(2) Bright orange bands
(3) Dark red bands
(4) Bright blue bands

117. The site of perception of light in plants during photoperiodism is :

- (1) Shoot apex (2) Stem
(3) Axillary bud (4) Leaf

118. When gene targetting involving gene amplification is attempted in an individual's tissue to treat disease, it is known as :

- (1) Biopiracy
(2) Gene therapy
(3) Molecular diagnosis
(4) Safety testing

119. Which of the following plants is monoecious?

- (1) *Carica papaya*
(2) *Chara*
(3) *Marchantia polymorpha*
(4) *Cycas circinalis*

120. Which of the following is **not** an application of PCR (Polymerase Chain Reaction) ?

- (1) Molecular diagnosis
(2) Gene amplification
(3) Purification of isolated protein
(4) Detection of gene mutation

121. Match **List -I** with **List - II**.

List -I		List -II	
(a)	Cristae	(i)	Primary constriction in chromosome
(b)	Thylakoids	(ii)	Disc-shaped sacs in Golgi apparatus
(c)	Centromere	(iii)	Infoldings in mitochondria
(d)	Cisternae	(iv)	Flattened membranous sacs in stroma of plastids

Choose the **correct** answer from the options given below.

- | | | | |
|-----------|-------|-------|------|
| (a) | (b) | (c) | (d) |
| (1) (iv) | (iii) | (ii) | (i) |
| (2) (i) | (iv) | (iii) | (ii) |
| (3) (iii) | (iv) | (i) | (ii) |
| (4) (ii) | (iii) | (iv) | (i) |

122. Diadelphous stamens are found in:

- (1) China rose
(2) Citrus
(3) Pea
(4) China rose and citrus

123. Match List -I with List - II.

List - I		List - II	
(a)	Protoplast fusion	(i)	Totipotency
(b)	Plant tissue culture	(ii)	Pomato
(c)	Meristem culture	(iii)	Somaclones
(d)	Micropropagation	(iv)	Virus free plants

Choose the **correct** answer from the options given below.

(a)	(b)	(c)	(d)
(1) (iii)	(iv)	(ii)	(i)
(2) (ii)	(i)	(iv)	(iii)
(3) (iii)	(iv)	(i)	(ii)
(4) (iv)	(iii)	(ii)	(i)

124. Amensalism can be represented as :

- (1) Species A (-); Species B (0)
- (2) Species A (+); Species B (+)
- (3) Species A (-); Species B (-)
- (4) Species A (+); Species B (0)

125. Which of the following is an **incorrect** statement?

- (1) Mature sieve tube elements possess a conspicuous nucleus and usual cytoplasmic organelles.
- (2) Microbodies are present both in plant and animal cells.
- (3) The perinuclear space forms a barrier between the materials present inside the nucleus and that of the cytoplasm.
- (4) Nuclear pores act as passages for proteins and RNA molecules in both directions between nucleus and cytoplasm.

126. A typical angiosperm embryo sac at maturity is :

- (1) 8-nucleate and 7-celled
- (2) 7-nucleate and 8-celled
- (3) 7-nucleate and 7-celled
- (4) 8-nucleate and 8-celled

127. Which of the following algae contains mannitol as reserve food material ?

- (1) *Ectocarpus*
- (2) *Gracilaria*
- (3) *Volvox*
- (4) *Ulothrix*

128. The plant hormone used to destroy weeds in a field is :

- (1) IAA
- (2) NAA
- (3) 2,4-D
- (4) IBA

129. The amount of nutrients, such as carbon, nitrogen, phosphorus and calcium present in the soil at any given time, is referred as :

- (1) Climax
- (2) Climax community
- (3) Standing state
- (4) Standing crop

130. Mutations in plant cells can be induced by:

- (1) Kinetin
- (2) Infrared rays
- (3) Gamma rays
- (4) Zeatin

131. Which of the following statements is **not** correct?

- (1) Pyramid of biomass in sea is generally inverted.
- (2) Pyramid of biomass in sea is generally upright.
- (3) Pyramid of energy is always upright.
- (4) Pyramid of numbers in a grassland ecosystem is upright.

132. In the equation $GPP - R = NPP$

R represents :

- (1) Radiant energy
- (2) Retardation factor
- (3) Environment factor
- (4) Respiration losses

133. Which of the following algae produce Carrageen?

- (1) Green algae
- (2) Brown algae
- (3) Red algae
- (4) Blue-green algae

134. The first stable product of CO_2 fixation in sorghum is :

- (1) Pyruvic acid
- (2) Oxaloacetic acid
- (3) Succinic acid
- (4) Phosphoglyceric acid

135. Match List -I with List - II.

List - I		List - II	
(a)	Lenticels	(i)	Phellogen
(b)	Cork cambium	(ii)	Suberin deposition
(c)	Secondary cortex	(iii)	Exchange of gases
(d)	Cork	(iv)	Phelloderm

Choose the **correct** answer from the options given below.

(a)	(b)	(c)	(d)
(1) (iv)	(i)	(iii)	(ii)
(2) (iii)	(i)	(iv)	(ii)
(3) (ii)	(iii)	(iv)	(i)
(4) (iv)	(ii)	(i)	(iii)

Section-B (Biology : Botany)**136.** Which of the following statements is **incorrect** ?

- (1) During aerobic respiration, role of oxygen is limited to the terminal stage.
- (2) In ETC (Electron Transport Chain), one molecule of $\text{NADH} + \text{H}^+$ gives rise to 2 ATP molecules, and one FADH_2 gives rise to 3 ATP molecules.
- (3) ATP is synthesized through complex V.
- (4) Oxidation-reduction reactions produce proton gradient in respiration.

137. Match **Column - I** with **Column - II**.**Column - I****Column - II**

- | | |
|--|------------------|
| (a) $\% \text{K}_{(5)} \text{C}_{1+2+(2)} \text{A}_{(9)+1} \text{G}_1$ | (i) Brassicaceae |
| (b) $\oplus \text{K}_{(5)} \text{C}_{(5)} \text{A}_{(5)} \text{G}_2$ | (ii) Liliaceae |
| (c) $\oplus \text{P}_{(3+3)} \text{A}_{(3+3)} \text{G}_{(3)}$ | (iii) Fabaceae |
| (d) $\oplus \text{K}_{(2+2)} \text{C}_4 \text{A}_{(2+4)} \text{G}_{(2)}$ | (iv) Solanaceae |

Select the **correct** answer from the options given below.

- | (a) | (b) | (c) | (d) |
|-----------|-------|-------|-------|
| (1) (iii) | (iv) | (ii) | (i) |
| (2) (i) | (ii) | (iii) | (iv) |
| (3) (ii) | (iii) | (iv) | (i) |
| (4) (iv) | (ii) | (i) | (iii) |

138. Match **List - I** with **List - II**.

List - I		List - II	
(a)	S phase	(i)	Proteins are synthesized
(b)	G ₂ phase	(ii)	Inactive phase
(c)	Quiescent stage	(iii)	Interval between mitosis and initiation of DNA replication
(d)	G ₁ phase	(iv)	DNA replication

Choose the **correct** answer from the options given below.

- | (a) | (b) | (c) | (d) |
|-----------|------|-------|-------|
| (1) (iii) | (ii) | (i) | (iv) |
| (2) (iv) | (ii) | (iii) | (i) |
| (3) (iv) | (i) | (ii) | (iii) |
| (4) (ii) | (iv) | (iii) | (i) |

139. Plasmid pBR322 has PstI restriction enzyme sitewithin gene amp^R that confers ampicillin resistance. If this enzyme is used for inserting a gene for β -galactoside production and the recombinant plasmid is inserted in an *E.coli* strain

- (1) it will not be able to confer ampicillin resistance to the host cell.
- (2) the transformed cells will have the ability to resist ampicillin as well as produce β -galactoside.
- (3) it will lead to lysis of host cell.
- (4) it will be able to produce a novel protein with dual ability.

140. Identify the **correct** statement.

- (1) In capping, methyl guanosine triphosphate is added to the 3' end of hnRNA.
- (2) RNA polymerase binds with Rho factor to terminate the process of transcription in bacteria.
- (3) The coding strand in a transcription unit is copied to an mRNA.
- (4) Split gene arrangement is characteristic of prokaryotes.

141. Now a days it is possible to detect the mutated gene causing cancer by allowing radioactive probe to hybridise its complimentary DNA in a clone of cells, followed by its detection using autoradiography because:

- (1) mutated gene partially appears on a photographic film.
- (2) mutated gene completely and clearly appears on a photographic film.
- (3) mutated gene does not appear on a photographic film as the probe has no complementarity with it.
- (4) mutated gene does not appear on photographic film as the probe has complementarity with it.

142. In the exponential growth equation

$$N_t = N_0 e^{rt}, e \text{ represents:}$$

- (1) The base of number logarithms
- (2) The base of exponential logarithms
- (3) The base of natural logarithms
- (4) The base of geometric logarithms

143. Select the **correct** pair.

- (1) Large colorless empty cells in the epidermis of grass leaves – Subsidiary cells
- (2) In dicot leaves, vascular bundles are surrounded by large thick-walled cells – Conjunctive tissue
- (3) Cells of medullary rays that form part of cambial ring – Interfascicular cambium
- (4) Loose parenchyma cells rupturing the epidermis and forming a lens-shaped opening in bark – Spongy parenchyma

144. In some members of which of the following pairs of families, pollen grains retain their viability for months after release ?

- (1) Poaceae ; Rosaceae
- (2) Poaceae; Leguminosae
- (3) Poaceae; Solanaceae
- (4) Rosaceae ; Leguminosae

145. What is the role of RNA polymerase III in the process of transcription in eukaryotes ?

- (1) Transcribes rRNAs (28S, 18S and 5.8S)
- (2) Transcribes tRNA, 5s rRNA and snRNA
- (3) Transcribes precursor of mRNA
- (4) Transcribes only snRNAs

146. Which of the following statements is **incorrect** ?

- (1) Both ATP and NADPH + H^+ are synthesized during non-cyclic photophosphorylation.
- (2) Stroma lamellae have PS I only and lack NADP reductase.
- (3) Grana lamellae have both PS I and PS II.
- (4) Cyclic photophosphorylation involves both PS I and PS II.

147. Which of the following statements is **correct** ?

- (1) Fusion of two cells is called Karyogamy.
- (2) Fusion of protoplasts between two motile or non-motile gametes is called plasmogamy.
- (3) Organisms that depend on living plants are called saprophytes.
- (4) Some of the organisms can fix atmospheric nitrogen in specialized cells called sheath cells.

148. Match **List - I** with **List - II**.

List - I		List - II	
(a)	Protein	(i)	C = C double bonds
(b)	Unsaturated fatty acid	(ii)	Phosphodiester bonds
(c)	Nucleic acid	(iii)	Glycosidic bonds
(d)	Polysaccharide	(iv)	Peptide bonds

Choose the **correct** answer from the options given below.

- | (a) | (b) | (c) | (d) |
|----------|-------|-------|-------|
| (1) (iv) | (i) | (ii) | (iii) |
| (2) (i) | (iv) | (iii) | (ii) |
| (3) (ii) | (i) | (iv) | (iii) |
| (4) (iv) | (iii) | (i) | (ii) |

149. DNA fingerprinting involves identifying differences in some specific regions in DNA sequence, called as :

- (1) Satellite DNA
- (2) Repetitive DNA
- (3) Single nucleotides
- (4) Polymorphic DNA

150. Match **Column - I** with **Column - II**.

Column - I		Column - II	
(a)	Nitrococcus	(i)	Denitrification
(b)	Rhizobium	(ii)	Conversion of ammonia to nitrite?
(c)	Thiobacillus	(iii)	Conversion of nitrite to nitrate
(d)	Nitrobacter	(iv)	Conversion of atmospheric nitrogen to ammonia

Choose the **correct** answer from options given below.

- | (a) | (b) | (c) | (d) |
|-----------|-------|-------|-------|
| (1) (ii) | (iv) | (i) | (iii) |
| (2) (i) | (ii) | (iii) | (iv) |
| (3) (iii) | (i) | (iv) | (ii) |
| (4) (iv) | (iii) | (ii) | (i) |

Section - A (Biology : Zoology)

- 151.** A specific recognition sequence identified by endonucleases to make cuts at specific positions within the DNA is :
- (1) Degenerate primer sequence
 - (2) Okazaki sequences
 - (3) Palindromic Nucleotide sequences
 - (4) Poly(A) tail sequences
- 152.** The fruit fly has 8 chromosomes ($2n$) in each cell. During interphase of Mitosis if the number of chromosomes at G_1 phase is 8, what would be the number of chromosomes after S phase ?
- (1) 8 (2) 16 (3) 4 (4) 32
- 153.** Which one of the following belongs to the family Muscidae ?
- (1) Fire fly (2) Grasshopper
 - (3) Cockroach (4) House fly
- 154.** Succus entericus is referred to as :
- (1) Pancreatic juice (2) Intestinal juice
 - (3) Gastric juice (4) Chyme
- 155.** With regard to insulin choose correct options.
- (a) C-peptide is not present in mature insulin.
 - (b) The insulin produced by rDNA technology has C-peptide.
 - (c) The pro-insulin has C-peptide.
 - (d) A-peptide and B-peptide of insulin are interconnected by disulphide bridges.
- Choose the **correct** answer from the options given below.
- (1) (b) and (d) only (2) (b) and (c) only
 - (3) (a), (c) and (d) only (4) (a) and (d) only
- 156.** Persons with 'AB' blood group are called as "Universal recipients". This is due to :
- (1) Absence of antigens A and B on the surface of RBCs
 - (2) Absence of antigens A and B in plasma
 - (3) Presence of antibodies, anti-A and anti-B, on RBCs
 - (4) Absence of antibodies, anti-A and anti-B, in plasma
- 157.** In a cross between a male and female, both heterozygous for sickle cell anaemia gene, what percentage of the progeny will be diseased?
- (1) 50% (2) 75%
 - (3) 25% (4) 100%
- 158.** Which enzyme is responsible for the conversion of inactive fibrinogens to fibrins?
- (1) Thrombin (2) Renin
 - (3) Epinephrine (4) Thrombokinas
- 159.** The partial pressures (in mm Hg) of oxygen (O_2) and carbon dioxide (CO_2) at alveoli (the site of diffusion) are :
- (1) $pO_2 = 104$ and $pCO_2 = 40$
 - (2) $pO_2 = 40$ and $pCO_2 = 45$
 - (3) $pO_2 = 95$ and $pCO_2 = 40$
 - (4) $pO_2 = 159$ and $pCO_2 = 0.3$
- 160.** Chronic auto immune disorder affecting neuro muscular junction leading to fatigue, weakening and paralysis of skeletal muscle is called as:
- (1) Arthritis
 - (2) Muscular dystrophy
 - (3) Myasthenia gravis
 - (4) Gout
- 161.** Which is the "Only enzyme" that has "Capability" to catalyse Initiation, Elongation and Termination in the process of transcription in prokaryotes ?
- (1) DNA dependent DNA polymerase
 - (2) DNA dependent RNA polymerase
 - (3) DNA Ligase
 - (4) DNase
- 162.** Which of the following RNAs is not required for the synthesis of protein ?
- (1) mRNA (2) tRNA
 - (3) rRNA (4) siRNA
- 163.** Which one of the following is an example of Hormone releasing IUD ?
- (1) CuT (2) LNG 20
 - (3) Cu 7 (4) Multiload 375
- 164.** If Adenine makes 30% of the DNA molecule, what will be the percentage of Thymine, Guanine and Cytosine in it ?
- (1) T : 20 ; G : 30 ; C : 20
 - (2) T : 20 ; G : 20 ; C : 30
 - (3) T : 30 ; G : 20 ; C : 20
 - (4) T : 20 ; G : 25 ; C : 25

165. Match List - I with List - II.

List-I		List-II	
(a)	Aspergillus niger	(i)	Acetic Acid
(b)	Acetobacter aceti	(ii)	Lactic Acid
(c)	Clostridium butylicum	(iii)	Citric Acid
(d)	Lactobacillus	(iv)	Butyric Acid

Choose the **correct** answer from the options given below.

- | | | | |
|-----------|-------|-------|-------|
| (a) | (b) | (c) | (d) |
| (1) (iii) | (i) | (iv) | (ii) |
| (2) (i) | (ii) | (iii) | (iv) |
| (3) (ii) | (iii) | (i) | (iv) |
| (4) (iv) | (ii) | (i) | (iii) |

166. Read the following statements.

- Metagenesis is observed in Helminths.
- Echinoderms are triploblastic and coelomate animals.
- Round worms have organ-system level of body organization.
- Comb plates present in ctenophores help in digestion.
- Water vascular system is characteristic of Echinoderms.

Choose the **correct** answer from the options given below.

- (c), (d) and (e) are correct
- (a), (b) and (c) are correct
- (a), (d) and (e) are correct
- (b), (c) and (e) are correct

167. Receptors for sperm binding in mammals are present on:

- Corona radiata
- Vitelline membrane
- Perivitelline space
- Zona pellucida

168. Match List - I with List - II.

List-I		List-II	
(a)	Metamerism	(i)	Coelenterata
(b)	Canal system	(ii)	Ctenophora
(c)	Comb plates	(iii)	Annelida
(d)	Cnidoblasts	(iv)	Porifera

Choose the **correct** answer from the options given below.

- | | | | |
|-----------|-------|------|-------|
| (a) | (b) | (c) | (d) |
| (1) (iv) | (iii) | (i) | (ii) |
| (2) (iii) | (iv) | (i) | (ii) |
| (3) (iii) | (iv) | (ii) | (i) |
| (4) (iv) | (i) | (ii) | (iii) |

169. Erythropoietin hormone which stimulates R.B.C. formation is produced by :

- Alpha cells of pancreas
- The cells of rostral adenohypophysis
- The cells of bone marrow
- Juxtaglomerular cells of the kidney

170. Venereal diseases can spread through :

- Using sterile needles
- Transfusion of blood from infected person
- Infected mother to foetus
- Kissing
- Inheritance

Choose the **correct** answer from the options given below.

- (a), (b) and (c) only
- (b), (c) and (d) only
- (b) and (c) only
- (a) and (c) only

171. Which of the following characteristics is **incorrect** with respect to cockroach?

- A ring of gastric caeca is present at the junction of midgut and hind gut.
- Hypopharynx lies within the cavity enclosed by the mouth parts.
- In females, 7th - 9th sterna together form a genital pouch.
- 10th abdominal segment in both sexes, bears a pair of anal cerci.

172. Match the following:

List-I		List-II	
(a)	Physalia	(i)	Pearl oyster
(b)	Limulus	(ii)	Portuguese Man of War
(c)	Ancylostoma	(iii)	Living fossil
(d)	Pinctada	(iv)	Hookworm

Choose the **correct** answer from the options given below.

- | | | | |
|----------|-------|-------|------|
| (a) | (b) | (c) | (d) |
| (1) (ii) | (iii) | (i) | (iv) |
| (2) (iv) | (i) | (iii) | (ii) |
| (3) (ii) | (iii) | (iv) | (i) |
| (4) (i) | (iv) | (iii) | (ii) |

- 173.** Which one of the following organisms bears hollow and pneumatic long bones?
 (1) *Neophron* (2) *Hemidactylus*
 (3) *Macropus* (4) *Ornithorhynchus*
- 174.** The centriole undergoes duplication during:
 (1) S-phase (2) Prophase
 (3) Metaphase (4) G₂ phase
- 175.** During the process of gene amplification using PCR, if very high temperature is not maintained in the beginning, then which of the following steps of PCR will be affected first?
 (1) Annealing
 (2) Extension
 (3) Denaturation
 (4) Ligation
- 176.** Which of the following is **not** an objective of Biofortification in crops?
 (1) Improve protein content
 (2) Improve resistance to diseases
 (3) Improve vitamin content
 (4) Improve micronutrient and mineral content
- 177.** Dobson units are used to measure thickness of:
 (1) CFCs (2) Stratosphere
 (3) Ozone (4) Troposphere
- 178.** Sphincter of oddi is present at :
 (1) Ileo-caecal junction
 (2) Junction of hepato-pancreatic duct and duodenum
 (3) Gastro-oesophageal junction
 (4) Junction of jejunum and duodenum
- 179.** Select the favourable conditions required for the formation of oxyhaemoglobin at the alveoli.
 (1) High pO₂, low pCO₂, less H⁺, lower temperature
 (2) Low pO₂, high pCO₂, more H⁺, higher temperature
 (3) High pO₂, high pCO₂, less H⁺, higher temperature
 (4) Low pO₂, low pCO₂, more H⁺, higher temperature

- 180.** Identify the **incorrect** pair.

- (1) Alkaloids - Codeine
 (2) Toxin - Abrin
 (3) Lectins - Concanavalin A
 (4) Drugs - Ricin

- 181.** Which of the following statements wrongly represents the nature of smooth muscle?

- (1) These muscle have no striations
 (2) They are involuntary muscles
 (3) Communication among the cells is performed by intercalated discs
 (4) These muscles are present in the wall of blood vessels

- 182.** For effective treatment of the disease, early diagnosis and understanding its pathophysiology is very important. Which of the following molecular diagnostic techniques is very useful for early detection?

- (1) Western Blotting Technique
 (2) Southern Blotting Technique
 (3) ELISA Technique
 (4) Hybridization Technique

- 183.** Match **List-I** with **List-II**.

List-I		List-II	
(a)	Vaults	(i)	Entry of sperm through Cervix is blocked
(b)	IUDs	(ii)	Removal of Vas deferens
(c)	Vasectomy	(iii)	Phagocytosis of sperms within the Uterus
(d)	Tubectomy	(iv)	Removal of fallopian tube

Choose the **correct** answer from the options given below.

- | (a) | (b) | (c) | (d) |
|-----------|-------|-------|-------|
| (1) (iv) | (ii) | (i) | (iii) |
| (2) (i) | (iii) | (ii) | (iv) |
| (3) (ii) | (iv) | (iii) | (i) |
| (4) (iii) | (i) | (iv) | (ii) |

- 184.** The organelles that are included in the endomembrane system are:

- (1) Endoplasmic reticulum, Mitochondria, Ribosomes and Lysosomes
 (2) Endoplasmic reticulum, Golgi complex, Lysosomes and Vacuoles
 (3) Golgi complex, Mitochondria, Ribosomes and Lysosomes
 (4) Golgi complex, Endoplasmic reticulum, Mitochondria and Lysosomes

185. Which stage of meiotic prophase shows terminalisation of chiasmata as its distinctive feature?

- (1) Leptotene (2) Zygotene
(3) Diakinesis (4) Pachytene

Section - B (Biology : Zoology)

186. Which of these is not an important component of initiation of parturition in humans?

- (1) Increase in estrogen and progesterone ratio
(2) Synthesis of prostaglandins
(3) Release of Oxytocin
(4) Release of Prolactin

187. Which of the following is **not** a step in Multiple Ovulation Embryo Transfer Technology (MOET)?

- (1) Cow is administered hormone having LH like activity for super ovulation
(2) Cow yields about 6-8 eggs at a time
(3) Cow is fertilized by artificial insemination
(4) Fertilized eggs are transferred to surrogate mothers at 8-32 cell stage

188. Match **List - I** with **List - II**.

List-I		List-II	
(a)	Allen's Rule	(i)	Kangaroo rat
(b)	Physiological adaptation	(ii)	Desert lizard
(c)	Behavioural adaptation	(iii)	Marine fish at depth
(d)	Biochemical Adaptation	(iv)	Polar seal

Choose the **correct** answer from the options given below.

- | | | | |
|------------|------------|------------|------------|
| (a) | (b) | (c) | (d) |
| (1) (iv) | (ii) | (iii) | (i) |
| (2) (iv) | (i) | (iii) | (ii) |
| (3) (iv) | (i) | (ii) | (iii) |
| (4) (iv) | (iii) | (ii) | (i) |

189. Assertion (A) :

A person goes to high altitude and experiences 'altitude sickness' with symptoms like breathing difficulty and heart palpitations.

Reason (R) :

Due to low atmospheric pressure at high altitude, the body does not get sufficient oxygen.

In the light of the above statements, choose the **correct** answer from the options given below.

(1) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**

(2) Both **(A)** and **(R)** are true but **(R)** is not the correct explanation of **(A)**

(3) **(A)** is true but **(R)** is false

(4) **(A)** is false but **(R)** is true

190. Following are the statements with reference to 'lipids'.

- (a) Lipids having only single bonds are called unsaturated fatty acids.
(b) Lecithin is a phospholipid.
(c) Trihydroxy propane is glycerol.
(d) Palmitic acid has 20 carbon atoms including carboxyl carbon.
(e) Arachidonic acid has 16 carbon atoms.

Choose the **correct** answer from the options given below.

- (1) (a) and (b) only (2) (c) and (d) only
(3) (b) and (c) only (4) (b) and (e) only

191. Match **List - I** with **List - II**.

List-I		List-II	
(a)	Scapula	(i)	Cartilaginous joints
(b)	Cranium	(ii)	Flat bone
(c)	Sternum	(iii)	Fibrous joints
(d)	Vertebral column	(iv)	Triangular flat bone

Choose the **correct** answer from the options given below.

- | | | | |
|------------|------------|------------|------------|
| (a) | (b) | (c) | (d) |
| (1) (i) | (iii) | (ii) | (iv) |
| (2) (ii) | (iii) | (iv) | (i) |
| (3) (iv) | (ii) | (iii) | (i) |
| (4) (iv) | (iii) | (ii) | (i) |

192. Identify the types of cell junctions that help to stop the leakage of the substances across a tissue and facilitation of communication with neighbouring cells via rapid transfer of ions and molecules.

- (1) Gap junctions and Adhering junctions, respectively.
(2) Tight junctions and Gap junctions, respectively.
(3) Adhering junctions and Tight junctions, respectively.
(4) Adhering junctions and Gap junctions, respectively.

193. Statement I :

The codon 'AUG' codes for methionine and phenylalanine.

Statement II :

'AAA' and 'AAG' both codons code for the amino acid lysine.

In the light of the above statements, choose the **correct** answer from the options given below.

- (1) Both **statement I** and **Statement II** are true.
- (2) Both **Statement I** and **Statement II** are false
- (3) **Statement I** is correct but **Statement II** is false
- (4) **Statement I** is incorrect but **Statement II** is true

194. Which of the following secretes the hormone, relaxin, during the later phase of pregnancy?

- (1) Graafian follicle
- (2) Corpus luteum
- (3) Foetus
- (4) Uterus

195. Following are the statements about prostomium of earthworm.

- (a) It serves as a covering for mouth.
- (b) It helps to open cracks in the soil into which it can crawl.
- (c) It is one of the sensory structures.
- (d) It is the first body segment.

Choose the **correct** answer from the options given below.

- (1) (a), (b) and (c) are correct
- (2) (a), (b) and (d) are correct
- (3) (a), (b), (c) and (d) are correct
- (4) (b) and (c) are correct

196. Which one of the following statements about Histones is **wrong**?

- (1) Histones are organized to form a unit of 8 molecules.
- (2) The pH of histones is slightly acidic.
- (3) Histones are rich in amino acids - Lysine and Arginine.
- (4) Histones carry positive charge in the side chain.

197. During muscular contraction which of the following events occur ?

- (a) 'H' zone disappears
- (b) 'A' band widens
- (c) 'I' band reduces in width
- (d) Myosine hydrolyzes ATP, releasing the ADP and Pi

(e) Z-lines attached to actins are pulled inwards

Choose the **correct** answer from the options given below.

- (1) (a), (c), (d), (e) only
- (2) (a), (b), (c), (d) only
- (3) (b), (c), (d), (e) only
- (4) (b), (d), (e), (a) only

198. The Adenosine deaminase deficiency results into:

- (1) Dysfunction of Immune system
- (2) Parkinson's disease
- (3) Digestive disorder
- (4) Addison's disease

199. Match **List - I** with **List - II**.

List - I		List - II	
(a)	Adaptive radiation	(i)	Selection of resistant varieties due to excessive use of herbicides and pesticides
(b)	Convergent evolution	(ii)	Bones of fore limbs in Man and Whale
(c)	Divergent evolution	(iii)	Wings of Butterfly and Bird
(d)	Evolution by anthropogenic action	(iv)	Darwin Finches

Choose the **correct** answer from the options given below.

- | | | | |
|------------|------------|------------|------------|
| (a) | (b) | (c) | (d) |
| (1) (iv) | (iii) | (ii) | (i) |
| (2) (iii) | (ii) | (i) | (iv) |
| (3) (ii) | (i) | (iv) | (iii) |
| (4) (i) | (iv) | (iii) | (ii) |

200. Match **List - I** with **List - II**.

List-I		List-II	
(a)	Filariasis	(i)	<i>Haemophilus influenzae</i>
(b)	Amoebiasis	(ii)	<i>Trichophyton</i>
(c)	Pneumonia	(iii)	<i>Wuchereria bancrofti</i>
(d)	Ringworm	(iv)	<i>Entamoeba histolytica</i>

Choose the **correct** answer from the options given below.

- | | | | |
|------------|------------|------------|------------|
| (a) | (b) | (c) | (d) |
| (1) (iv) | (i) | (iii) | (ii) |
| (2) (iii) | (iv) | (i) | (ii) |
| (3) (i) | (ii) | (iv) | (iii) |
| (4) (ii) | (iii) | (i) | (iv) |

ANSWER KEY

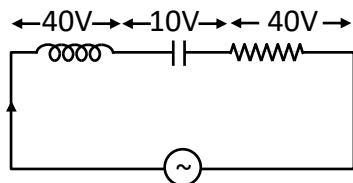
NEET(UG)-2021

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	4	1	2	1	3	2	3	1	3	4	4	2	2	3	2
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	4	2	3	2	4	4	2	4	2	4	2	4	1	1	3
Que.	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Ans.	3	3	4	1	2	4	3	2	4	4	1	2	2	4	4
Que.	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ans.	3	1	1	4	4	2	1	3	2	2	3	1	4	2	1
Que.	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Ans.	2	1	4	1	3	1	1	2	4	2	4	3	4	2	1
Que.	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
Ans.	1	1	1	2	3	1	3	4	3	4	4	3	3	3	2
Que.	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105
Ans.	3	1	4	4	3	4	3	3	2	1	1	1	2	1	1
Que.	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
Ans.	3	1	4	3	4	4	3	2	3	1	2	4	2	2	3
Que.	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135
Ans.	3	3	2	1	1	1	1	3	3	3	2	4	3	2	2
Que.	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
Ans.	2	1	3	1	2	3	3	3	4	2	4	2	1	2	1
Que.	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165
Ans.	3	1	4	2	3	4	3	1	1	3	2	4	2	3	1
Que.	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
Ans.	4	4	3	4	3	1	3	1	1	3	2	3	2	1	4
Que.	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195
Ans.	3	3	2	2	3	4	1	3	1	3	4	2	4	2	1
Que.	196	197	198	199	200										
Ans.	2	1	1	1	2										

HINT - SHEET

1. $I_0 = 10\sqrt{2} \text{ A}$

$$I_{\text{RMS}} = \frac{I_0}{\sqrt{2}} = 10 \text{ A}$$

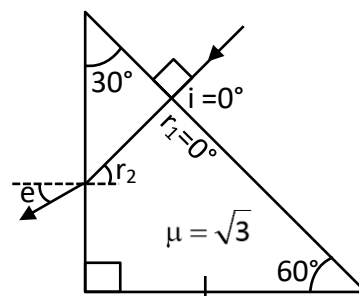


$$V_{\text{RMS}} = \sqrt{V_R^2 + (V_L - V_C)^2}$$

$$= \sqrt{(40)^2 + (40 - 10)^2} = 50 \text{ V}$$

$$Z = \frac{V_{\text{RMS}}}{I_{\text{RMS}}} = \frac{50 \text{ V}}{10 \text{ V}} = 5 \Omega$$

2.



$$r_1 + r_2 = A = 30^\circ$$

$$r_2 = 30^\circ \text{ (} r_1 = 0^\circ \text{)}$$

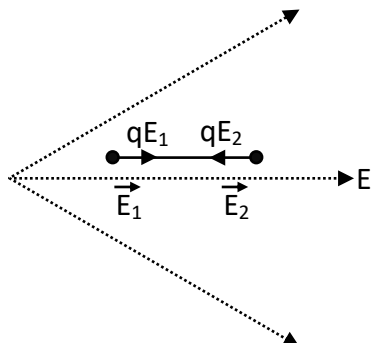
from Snell's law

$$\sqrt{3} \sin r_2 = 1 \times \sin e$$

$$\sqrt{3} \sin 30^\circ = \sin e \quad e = 60^\circ$$

3. $|\vec{E}_1| > |\vec{E}_2|$ o

as field lines are closer at charge +q,
So, net force on the dipole acts towards right side.
Also, A system always moves to decrease its potential energy.



4. $q = CV$

$$\frac{dq}{dt} = C \frac{dv}{dt}$$

$$I_d = C(V_0 \omega \cos \omega t)$$

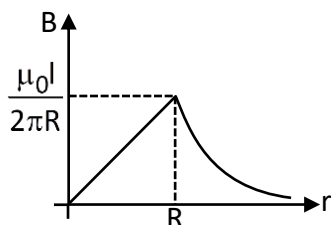
$$= V_0 \omega C \cos \omega t$$

5. Inside a current carrying cylindrical conductor,

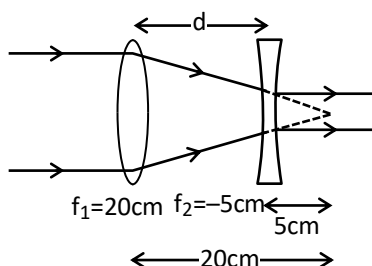
$$B = \frac{\mu_0 I}{2\pi R^2} r \quad \therefore B \propto r$$

Outside the conductor,

$$B = \frac{\mu_0 I}{2\pi r} \quad \therefore B \propto \frac{1}{r}$$



6.



$$d = f_1 + f_2$$

$$= 20 - 5$$

$$= 15 \text{ cm}$$

7. $\frac{hc}{\lambda} = K_{\max} + \phi$ [given ϕ is negligible]

so, $\frac{hc}{\lambda} = K_{\max}$

and $\lambda_d = \frac{h}{\sqrt{2m K_{\max}}} \Rightarrow K_{\max} = \frac{h^2}{2m\lambda_d^2}$

$$\left(\frac{hc}{\lambda}\right) = \frac{h^2}{2m\lambda_d^2} \Rightarrow \lambda = \left(\frac{2mc}{h}\right) \lambda_d^2$$

8. (A) $v_d = \left(\frac{eE}{m}\right)\tau$

(B) $J = \sigma E = E/\rho \Rightarrow \rho = E/J$

(C) $\rho = \frac{E}{nev_d}$

$$v_d = \frac{E}{nep}$$

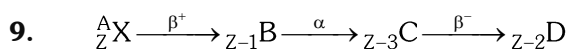
$$\frac{eE}{m}\tau = \frac{E}{nep}$$

$$\tau = \frac{m}{ne^2\rho}$$

(D) $i = neAv_d$

$$\frac{i}{A} = nev_d$$

$$J = nev_d$$

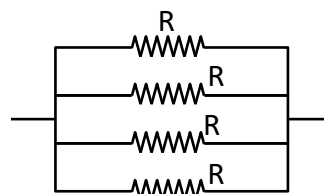


β^+ decreases atomic number by 1

α decreases atomic number by 2

β^- increases atomic number by 1

10. $R_{||} = \frac{R}{4} = 0.25 \Omega$



$$R = 1 \Omega$$

$$R_{\text{series}} = 4R = 4(1) = 4\Omega$$

11. $U + KE = E$

$$4U = E = mgS$$

$$4mgh = mgS$$

$$h = \frac{S}{4}$$

$$V = \sqrt{2g\left(\frac{3S}{4}\right)} = \sqrt{\frac{3gS}{2}}$$

12. $\frac{A}{A_0} = \left(\frac{1}{2}\right)^{t/T_H} = \left(\frac{1}{2}\right)^{150/100} = \frac{1}{2\sqrt{2}}$

13. According to Newton's law of cooling

$$\frac{T_1 - T_2}{t} = K \left[\frac{T_1 + T_2}{2} - T_0 \right]$$

For 1st cup of coffee,

$$\Rightarrow \frac{90 - 80}{t} = K \left[\frac{90 + 80}{2} - 20 \right] \quad \dots(1)$$

For 2nd cup of coffee,

$$\Rightarrow \frac{80 - 60}{t'} = K \left[\frac{80 + 60}{2} - 20 \right] \quad \dots(2)$$

Divide (1) by (2)

$$\frac{t'}{2t} = \frac{65}{50} \Rightarrow t' = \frac{13}{5}t$$

$$14. \quad P = \frac{nhc}{\lambda} \Rightarrow n = \frac{P\lambda}{hc}$$

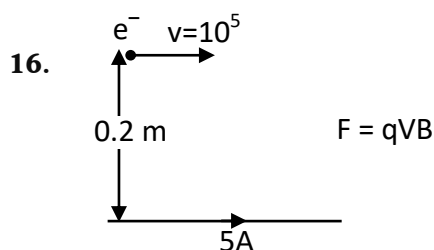
$$n = \frac{3.3 \times 10^{-3} \times 600 \times 10^{-9}}{6.6 \times 10^{-34} \times 3 \times 10^8} = 10^{16}$$

15. Displacement equation of SHM of frequency 'n'
 $x = A \sin(\omega t) = A \sin(2\pi nt)$
 Now,

$$\text{Potential energy } U = \frac{1}{2} kx^2 = \frac{1}{2} KA^2 \sin^2(2\pi nt)$$

$$= \frac{1}{2} kA^2 \left[\frac{1 - \cos(2\pi(2n)t)}{2} \right]$$

So frequency of potential energy = 2n



$$F = ev \left(\frac{\mu_0 i}{2\pi r} \right)$$

$$F = \frac{1.6 \times 10^{-19} \times 10^5 \times 2 \times 10^{-7} \times 5}{0.2}$$

$$F = 8 \times 10^{-20} \text{ Newton}$$

17. $E \propto F^a A^b T^c$
 $[M^1 L^2 T^{-2}] = [M^1 L^1 T^{-2}]^a [LT^{-2}]^b [T]^c$
 Solving, $a = 1 \dots (i)$
 $a + b = 2 \Rightarrow b = 1 \dots (ii)$
 $-2a - 2b + c = -2 \Rightarrow c = 2 \dots (iii)$
 $a = 1 \quad b = 1 \quad c = 2$

$$E = [F] [A] [T^2]$$

18. Root mean square speed of gas molecules

$$v_{\text{rms}} = \sqrt{\frac{3RT}{M}}$$

Pressure exerted by ideal Gas

$$P = \frac{1}{3} \rho v_{\text{rms}}^2$$

$$P = \frac{1}{3} mnv^2$$

$$\rho = mn, v_{\text{rms}}^2 = \bar{v}^2$$

Average kinetic energy of a molecule

$$KE = \frac{3}{2} KT$$

Total internal energy of 1 mole of a diatomic gas

$$U = \frac{5}{2} \mu RT$$

or $U = \frac{5}{2} RT$ (For 1 mole diatomic gas)

19. S_n = Distance in n^{th} sec. i.e. $t = n - 1$ to $t = n$

$$S_{n+1} = \text{Distance in } (n+1)^{\text{th}} \text{ sec.}$$

$$\text{i.e. } t = n \text{ to } t = n + 1$$

So as we know

$$S_n = \frac{a}{2}(2n-1) \quad a = \text{acceleration}$$

$$\frac{S_n}{S_{n+1}} = \frac{\frac{a}{2}(2n-1)}{\frac{a}{2}(2(n+1)-1)} = \frac{2n-1}{2n+1}$$

$$\frac{S_n}{S_{n+1}} = \frac{2n-1}{2n+1}$$

20. $X^{240} \rightarrow Y^{120} + Z^{120}$

given binding energy per nucleon of X, Y & Z are 7.6 MeV, 8.5 MeV & 8.5 MeV respectively.

Gain in binding energy is :-

$$Q = \text{Binding Energy of products} - \text{Binding energy of reactants}$$

$$= (120 \times 8.5 \times 2) - (240 \times 7.6) \text{ MeV}$$

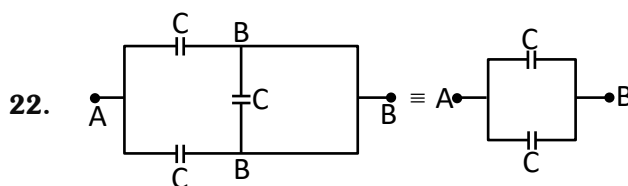
$$= 216 \text{ MeV}$$

21. Least count = $\frac{1\text{mm}}{100} = 0.01\text{mm}$

Diameter = main scale reading + circular scale reading

$$\text{Diameter} = 0 + 52 \times 0.01 \text{ mm}$$

$$= 0.52 \text{ mm} = 0.052 \text{ cm}$$



(one capacitor gets shorted)

$$\Rightarrow C_{\text{eq}} = C_1 + C_2$$

$$= C + C$$

$$= 2C$$

23. $MP = \frac{f_0}{f_e}$ (f_0 focal length of obj.)

$$R.P. = \frac{a}{1.22\lambda} \quad (a = \text{aperture of objective})$$

large aperture(a) of the objective lens provides better resolution \therefore good quality of image is formed and also it gathers more light.

24. For a conducting sphere

$$E = \frac{\sigma}{\epsilon_0}$$

$$V = \frac{\sigma R}{\epsilon_0}$$

as both spheres have same potential after connecting with wire,

$$V_1 = V_2$$

$$\sigma_1 R_1 = \sigma_2 R_2 \Rightarrow \frac{\sigma_1}{\sigma_2} = \frac{R_2}{R_1}$$

25. $F = kx$

$$10 = k(5 \times 10^{-2})$$

$$k = \frac{10}{5 \times 10^{-2}} = 2 \times 10^2 = 200 \text{ N/m}$$

$$\text{Now } T = 2\pi\sqrt{\frac{m}{k}} = 2\pi\sqrt{\frac{2}{200}} = \frac{2\pi}{10} = 0.628 \text{ sec.}$$

26. \vec{v} is parallel to $\vec{E} \times \vec{B}$ (as $\hat{v} = \hat{i}$)

$$\text{Option (1) } \vec{E} \times \vec{B} = \vec{0} \quad (\vec{E} \parallel \vec{B})$$

$$\text{Option (2) } \vec{E} \times \vec{B} = 2\hat{i} \text{ (parallel to } \vec{v} \text{)}$$

$$\text{Option (3) } \vec{E} \times \vec{B} = \vec{0} \quad (\vec{E} \perp \vec{B})$$

$$\text{Option (4) } \vec{E} \times \vec{B} = \vec{0} \quad (\vec{E} \parallel \vec{B})$$

27. $v_e = \sqrt{\frac{2GM}{R}} = \sqrt{\frac{2G}{R} \times \frac{4}{3}\pi R^3 \rho}$

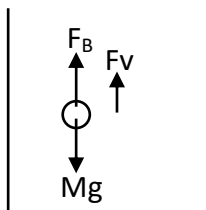
$$\text{or } v_e = \sqrt{\frac{8\pi G \rho}{3} R^2}$$

$$\Rightarrow v_e \propto R \Rightarrow \frac{v_e}{v} = \frac{4R}{R} \Rightarrow v_e = 4v$$

28. $\frac{E_1}{E_2} = \frac{\phi \ell_1}{\phi \ell_2}$

$$\frac{1.5}{2.5} = \frac{36}{\ell_2} \Rightarrow \ell_2 = 36 \times \frac{5}{3} = 60 \text{ cm}$$

29. Mass = M



Density of ball = d

Density of glycerine = $\frac{d}{2}$

$$F_B = V_s \rho_\ell g = V \frac{d}{2} g$$

$$F_g = Mg = vdg$$

for constant velocity, $F_{\text{net}} = 0$

$$\therefore F_B + F_v = Mg$$

$$F_v = Mg - F_B = Vdg - \frac{Vdg}{2} = \frac{Vdg}{2} = \frac{Mg}{2}$$

30. $E = \frac{1}{2} CV^2$

$$= \frac{1}{2} \left(\frac{\epsilon_0 A}{d} \right) (Ed)^2$$

$$= \frac{1}{2} \epsilon_0 E^2 Ad$$

31. In N type semiconductor majority charge carriers are e^- and P type semiconductor majority charge carriers are holes.

$$I = neAV_d = neA (\mu E)$$

$$\mu_e > \mu_h \Rightarrow I_e > I_h$$

32. Reverse bias Zener diode is used as a voltage regulator

for Ge Potential barrier $V_0 = 0.3 \text{ V}$

Si Potential barrier $V_0 = 0.7 \text{ V}$

33. Polar molecules have centres of positive and negative charges separated by some distance, so they have permanent dipole moment.

34. $E = \text{energy} = [ML^2T^{-2}]$

$$G = \text{Gravitational constant} = [M^{-1}L^3T^{-2}]$$

$$\text{So } \frac{E}{G} = \frac{[E]}{[G]} = \frac{ML^2T^{-2}}{M^{-1}L^3T^{-2}} = [M^2L^{-1}T^0]$$

35. $P_{\text{in}} = \frac{mgh}{t} = \frac{15 \times 10 \times 60}{1}$

$$= 9000 \text{ W}$$

$$P_{\text{out}} = 90\% \text{ of } P_{\text{in}}$$

$$\Rightarrow 8.1 \text{ kW}$$

36. velocity of car at $t = 4$ sec is

$$\begin{aligned} v &= u + at \\ v &= 0 + 5(4) \\ &= 20 \text{ m/s} \end{aligned}$$

At $t = 6$ sec

acceleration is due to gravity

$$\therefore a = g = 10 \text{ m/s}^2$$

$$v_x = 20 \text{ m/s (due to car)}$$

$$v_y = u + a(t-4)$$

$$= 0 + g(2) \text{ (downward)}$$

$$= 20 \text{ m/s (downward)}$$

$$v = \sqrt{v_x^2 + v_y^2}$$

$$= \sqrt{20^2 + 20^2}$$

$$= 20\sqrt{2} \text{ m/s}$$

37. $Y = A \cdot B + \overline{B} \cdot \overline{C} = AB + \overline{B} + \overline{C}$

- (i) 0 to t_1 $A = 0, B = 0, C = 1$

$$Y = 0 \cdot 0 + \overline{0} \cdot \overline{1} = 0 + 1 = 1$$

- (ii) t_1 to t_2 $A = 1, B = 0, C = 1$

$$Y = 1 \cdot 0 + \overline{0} \cdot \overline{1} = 0 + 1 = 1$$

- (iii) t_2 to t_3 $A = 0, B = 1, C = 0$

$$Y = 0 \cdot 1 + \overline{1} \cdot \overline{0} = 0 + 1 = 1$$

38. Velocity just before striking the ground

$$v_1 = \sqrt{2gh}$$

$$v_1 = \sqrt{2(10)(10)} = 10\sqrt{2} \text{ m/s}$$

$$v_1 = -10\sqrt{2} \hat{j}$$

If it reaches the same height, speed remains same after collision only the direction changes.

$$v_2 = 10\sqrt{2} \text{ m/s}$$

$$\vec{v}_2 = 10\sqrt{2} \hat{j}$$

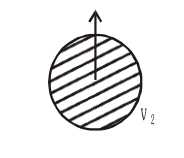
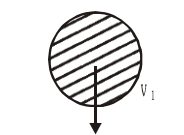
$$|\text{Impulse}| = m |\Delta \vec{v}|$$

$$= m |10\sqrt{2} \hat{j} - (-10\sqrt{2} \hat{j})|$$

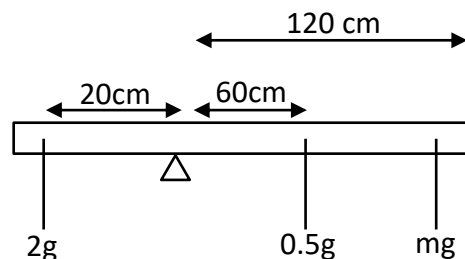
$$= 0.15 [2(10\sqrt{2})]$$

$$= 3\sqrt{2} \text{ kg m/s}$$

$$= 4.2 \text{ kg m/s}$$



- 39.



By balancing torque

$$2g \times 20 = 0.5g \times 60 + mg \times 120$$

$$m = \frac{0.5}{6} \text{ kg} = \frac{1}{12} \text{ kg}$$

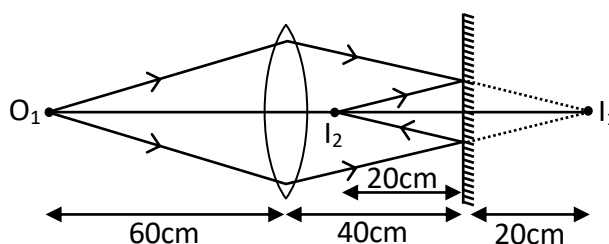
40. first, for image formation from lens

$$u = -60 \text{ cm}$$

$$f = +30 \text{ cm}$$

$$\Rightarrow v = \frac{uf}{u+f} = \frac{-60 \times 30}{-60+30} = 60 \text{ cm}$$

this real image formed by lens acts as virtual object for mirror



Real image from plane mirror is formed 20 cm in front of mirror, hence at 20 cm distance from lens.

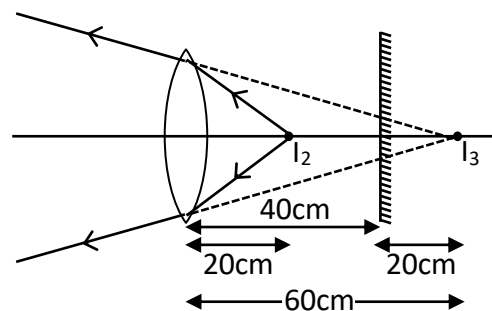
Now, for second refraction from lens,

$$u = -20 \text{ cm}$$

$$f = +30 \text{ cm}$$

$$v = \frac{uf}{u+f} = \frac{-20 \times 30}{-20+30} = -60 \text{ cm}$$

So, final virtual image is 60 cm from lens, or 20 cm behind mirror



41. $220 \times i_p = 44$

$$\Rightarrow i_p = \frac{44}{220} = \frac{1}{5} = 0.2 \text{ A}$$

42. $i \propto \frac{1}{r}$ [V is same for r_2 & r_3]

$$\frac{i_2}{i_3} = \frac{r_3}{r_2}$$

$$i_3 = \frac{r_2}{r_2 + r_3} i_1$$

$$\frac{i_3}{i_1} = \frac{r_2}{r_2 + r_3}$$

43. $\vec{F} = q(\vec{v} \times \vec{B})$

$$4\hat{i} - 20\hat{j} + 12\hat{k} = 1 \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 2 & 4 & 6 \\ B & B & B_0 \end{vmatrix}$$

Comparing

$$\begin{cases} \Rightarrow 4 = 4B_0 - 6B \\ -20 = -2B_0 + 6B \\ 12 = 2B - 4B \end{cases} \quad \left. \begin{array}{l} \text{Solving} \\ B = -6 \\ B_0 = -8 \end{array} \right\}$$

$$\therefore \vec{B} = -6\hat{i} - 6\hat{j} - 8\hat{k}$$

44. $h = \frac{R}{\frac{2gR}{V^2} - 1} = \frac{R}{\frac{V_e^2}{k^2 V_e^2} - 1} = \frac{Rk^2}{1 - k^2}$

45. Volume conservation

$$\frac{4}{3}\pi R^3 = 27\left(\frac{4}{3}\pi r^3\right) \Rightarrow R = 3r \quad \dots(1)$$

$$\text{and } V = \frac{Kq}{r} \Rightarrow \frac{V_1}{V_2} = \left(\frac{q_1}{q_2}\right)\left(\frac{r_2}{r_1}\right)$$

$$\Rightarrow \frac{220}{V_2} = \left(\frac{q}{27q}\right)\left(\frac{3r}{r}\right)$$

$$\Rightarrow \frac{220}{V_2} = \frac{1}{9}$$

$$\Rightarrow V_2 = 220 \times 9 = 1980 \text{ Volt}$$

46. $Q = \frac{\omega}{\Delta\omega} = \frac{\omega L}{R} \Rightarrow \Delta\omega = R/L = \frac{50}{4} = 8 \text{ rad/sec}$

$$\omega_0 = \frac{1}{\sqrt{LC}} = \frac{1}{\sqrt{5 \times 80 \times 10^{-6}}} = 50 \text{ rad/sec.}$$

$$\omega_{\min} = \omega_0 - \frac{\Delta\omega}{2} = 46 \text{ rad/sec}$$

$$\omega_{\max} = \omega_0 + \frac{\Delta\omega}{2} = 54 \text{ rad/sec}$$

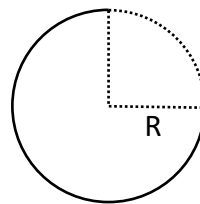
47. $M_1 = \left(\frac{\sqrt{3}}{4}a^2\right)I \times 4 = \sqrt{3}Ia^2$ (no. of turns = 4)

$$M_2 = a^2I \times 3 = 3Ia^2$$
 (no. of turns = 3)

48. $M_{\text{remain}} = \frac{3}{4}M$

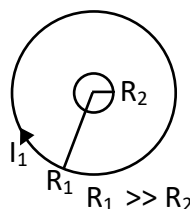
$$I = M_{\text{remain}} R^2$$

$$= \frac{3}{4}MR^2$$



49. $M = \frac{\phi_{12}}{I_1} = \frac{B_1 A_2}{I_1} = \frac{\left(\frac{\mu_0 I_1}{2R_1}\right)(\pi R_2^2)}{I_1}$

$$M = \frac{\mu_0 \pi R_2^2}{2R_1}$$



$$M \propto \frac{R_2^2}{R_1}$$

50. $T = \frac{2\pi R}{v} \Rightarrow v = \frac{2\pi R}{T} \quad \dots\dots(1)$

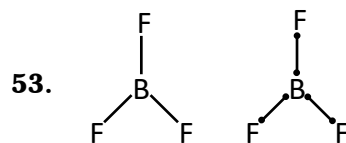
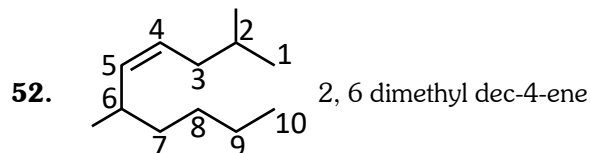
$$H_{\max} = \frac{v^2 \sin^2 \theta}{2g} = \frac{2\pi^2 R^2 \sin^2 \theta}{gT^2} = 4R$$

$$\sin \theta = \left(\frac{2gT^2}{\pi^2 R}\right)^{1/2}$$

$$\theta = \sin^{-1} \left[\frac{2gT^2}{\pi^2 R} \right]^{1/2}$$

51. Aspirin and paracetamol belongs to the class of non-narcotic analgesic.

Morphine and heroin are narcotic analgesics.



sp^2 , Trigonal planar $6e^-$ around central atom

54. Noble gases have weak dispersion forces so their melting and boiling point are very low.

$$55. \lambda_m^\infty(\text{NaCl}) = 126.45 \text{ Scm}^2 \text{ mol}^{-1}$$

$$\lambda_m^\infty(\text{HCl}) = 426.16 \text{ Scm}^2 \text{ mol}^{-1}$$

$$\lambda_m^\infty(\text{CH}_3\text{COONa}) = 91 \text{ Scm}^2 \text{ mol}^{-1}$$

$$\therefore \lambda_m^\infty(\text{CH}_3\text{COOH}) = \lambda_m^\infty(\text{CH}_3\text{COONa})$$

$$+ \lambda_m^\infty(\text{HCl}) - \lambda_m^\infty(\text{NaCl})$$

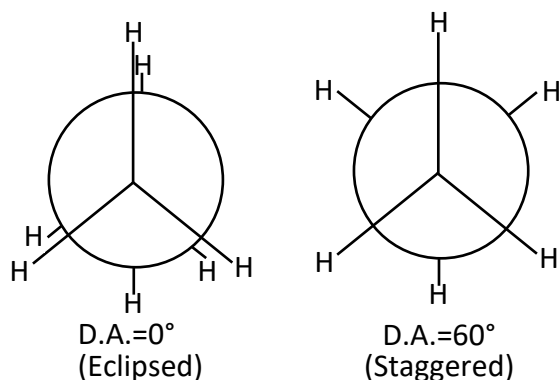
$$= 91 + 426.16 - 126.45$$

$$= 390.71 \text{ Scm}^2 \text{ mol}^{-1}$$

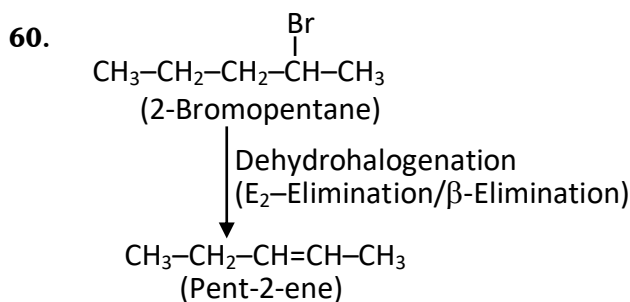
56. Tyndall effect is exhibited by colloidal solutions. Starch solution is a colloidal solution.

57. Vitamin B₁₂ deficiency → Pernicious anaemia (RBC deficient in haemoglobin)

58. Dihedral angle (D.A.) of least stable conformer of ethane = 0°



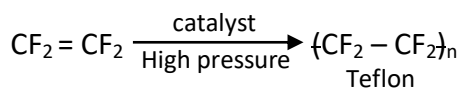
59. Most of the trivalent lanthanoid ions are coloured in the solid state.



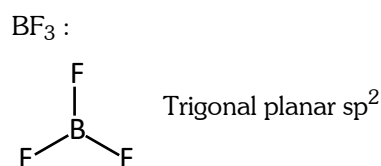
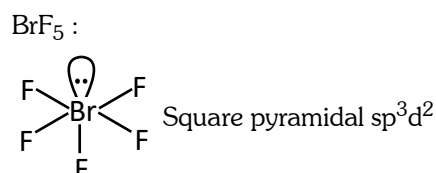
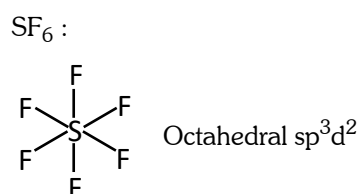
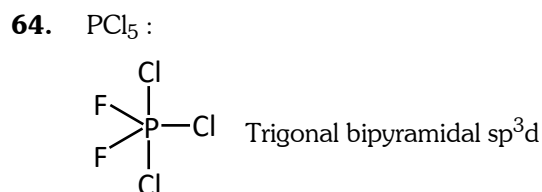
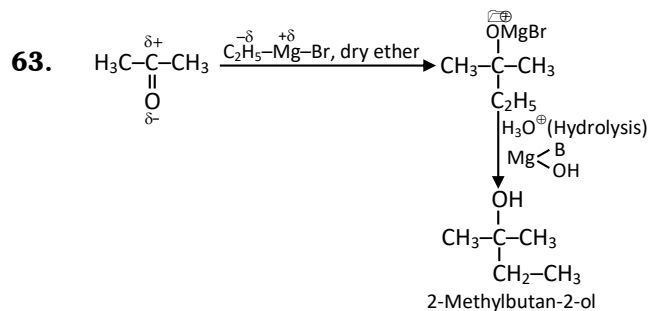
(Major product by Saytzeff's rule)

61. For one mole of an ideal gas
 $C_p - C_v = R$

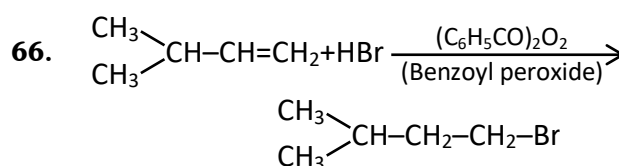
62. Teflon are prepared by addition polymerisation from tetrafluoroethene



Nylon-66, Novolac, Dacron are prepared by condensation polymerisation.



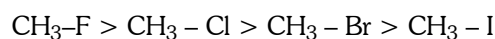
65. At room temperature Hg is liquid and it is purified by 'Distillation method'.



In the presence of peroxide, addition of HBr to unsymmetrical alkenes take place by anti-Markovnikov's rule/Peroxide effect/Kharash effect.

67. Tritium is radioactive and emits low energy β⁻ particles (1e⁻)

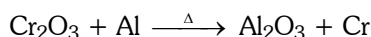
68. Correct sequence of bond enthalpy of C-X bond is



69. No. of atoms in Hexagonal primitive unit cell = 6
 No. of Tetrahedral voids = $2 \times$ No. of atoms per unit cell
 $= 2 \times 6$
 $= 12$

No. of Octahedral voids = No. of atoms per unit cell
 $= 6$

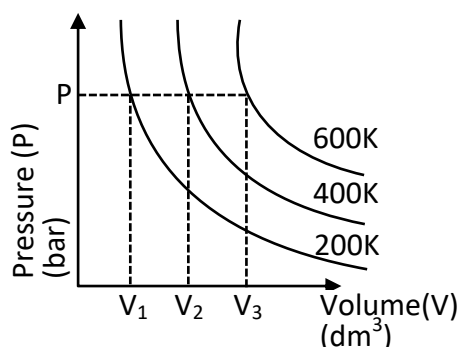
70. Aluminium is more electropositive than Cr, so it displaced chromium from Cr_2O_3 .



71. According to Boyle's law

$$P \propto \frac{1}{V}$$

At a given pressure,
 $V \propto T$



72. Dimethylammonium acetate is a weak acid & weak base type of salt

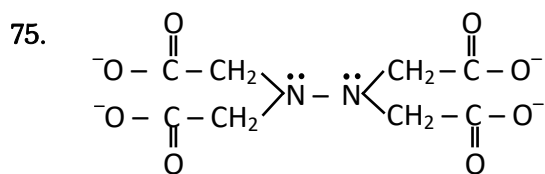
$$\text{pH} = 7 + \frac{1}{2} \text{p}K_a - \frac{1}{2} \text{p}K_b$$

$$= 7 + \frac{1}{2} \times 4.77 - \frac{1}{2} \times 3.27$$

$$= 7.75$$

73. BeCl_2 is covalent and soluble in an organic solvent.

74. The maximum temperature that can be achieved in blast furnace is upto 2200 K.



Donor atom (N, N, O, O, O, O)

76. $\pi = iCRT$

$$P_1 = 1 \times \frac{10}{180} \times R \times T \quad (\text{For Glucose})$$

$$P_2 = 1 \times \frac{10}{60} \times R \times T \quad (\text{For Urea})$$

$$P_3 = 1 \times \frac{10}{342} \times R \times T \quad (\text{For Sucrose})$$

$$\therefore P_2 > P_1 > P_3$$

77.

H-F	H-Cl	H-Br	H-I
1s-2p	1s-3p	1s-4p	1s-5p

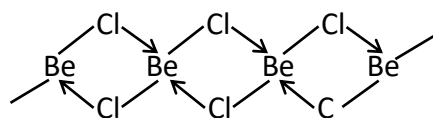
→

Down the group size increases

Overlapping decreases

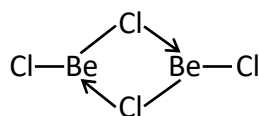
Acidic strength increases

78. BeCl_2 in solid state exist in a polymeric form & in a vapour state in exist in a dimeric form.



chain polymeric structure

Vapour state exist in a dimeric form



79. For a given reaction ΔH is negative. Hence, potential energy profile is of an exothermic reaction.

80. Due to lanthanoid contraction Zr and Hf has similar atomic and ionic radii.

81. $\lambda = \frac{c}{\nu}$

$$\lambda = \frac{3 \times 10^8}{1368 \times 10^3} = 219.298 \text{ m} \approx 219.3 \text{ m}$$

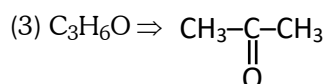
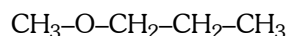
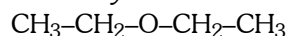
Element	%	At.weight	$\frac{\%}{\text{At.weight}}$	simplest ratio
---------	---	-----------	-------------------------------	----------------

82.

C	78	12	6.5	1
H	22	1	22	≈ 3

Empirical formula of this compound is CH_3

83. (4) $\text{C}_4\text{H}_{10}\text{O}$ will have different alkyl group attached with polyvalent functional group that's why show metamerism



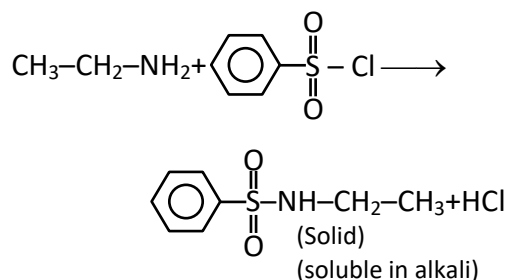
Only one arrangement possible so can not show metamerism.



Only one arrangement possible so can not show metamerism.

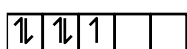
- (1) No polyvalent functional group in C_5H_{12} , so can not show metamerism.

84. 1° amines react with Hinsberg's reagent to give a solid, which dissolve in alkali.

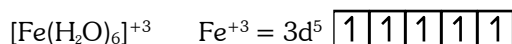


85. The number of Body centred unit cells in all 14 types of Bravais lattice unit cells is 3.

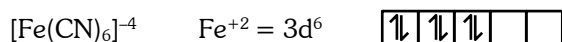
86. $[\text{Fe}(\text{CN})_6]^{3-}$ $\text{Fe}^{+3} = 3d^5$



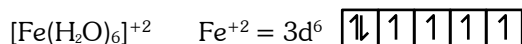
Unpaired electron = 1, $\mu = 1.7$ BM



Unpaired electrons = 5, $\mu = 5.9$ BM



Unpaired electron = 0, $\mu = 0$ BM



Unpaired electrons = 4, $\mu = 4.9$ BM

87. $n_{\text{O}_2} = \frac{4}{32} = \frac{1}{8} \text{ mol}$

$$n_{\text{H}_2} = \frac{2}{2} = 1 \text{ mol}$$

$$n_{\text{Total}} = n_{\text{O}_2} + n_{\text{H}_2} = \frac{1}{8} + 1 = \frac{9}{8} \text{ mol}$$

$$PV = nRT$$

$$P_{\text{Total}} \times 1 = \frac{9}{8} \times 0.082 \times 273$$

$$P_{\text{Total}} = 25.18 \text{ atm}$$

88. $\text{CH}_3\text{CH}_2\text{COO}^- \text{Na}^+ \xrightarrow[\text{Heat}]{\text{NaOH} + ?} \text{CH}_3\text{CH}_3 + \text{Na}_2\text{CO}_3$

Decarboxylation takes place by soda-lime (NaOH + CaO)

89. For irreversible expansion of an ideal gas under isothermal condition

$$\Delta U = 0, \Delta S_{\text{Total}} \neq 0$$

90. $\text{H}_2\text{O} < \text{H}_2\text{S} < \text{H}_2\text{Se} < \text{H}_2\text{Te}$

Down the group acidic strength increases
So pK_a value decreases

91. $\Lambda_{\text{M}(\text{CH}_3\text{COOH})}^0 = \Lambda_{\text{M}(\text{H}^+)}^0 + \Lambda_{\text{M}(\text{CH}_3\text{COO}^-)}^0$
 $= 350 + 50 = 400 \text{ Scm}^2\text{mol}^{-1}$

$$\alpha = \frac{\Lambda_{\text{M}}^c}{\Lambda_{\text{M}}^0}$$

$$\alpha = \frac{20}{400} = 5 \times 10^{-2}$$

$$\text{K}_{\text{a}(\text{CH}_3\text{COOH})} = C\alpha^2$$

$$= 0.007 \times (5 \times 10^{-2})^2$$

$$= 1.75 \times 10^{-5} \text{ mol L}^{-1}$$

92. $\ell n K = \ell n A - \frac{E_a}{R} \left(\frac{1}{T} \right)$

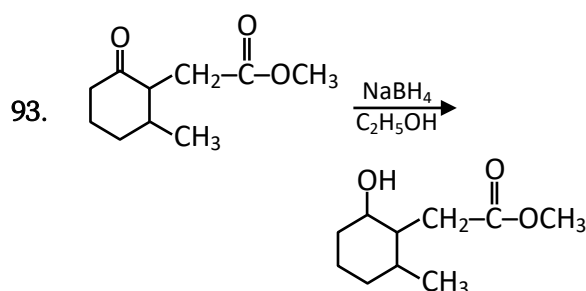
In $\ell n k$ v/s $\frac{1}{T}$ graph

$$\text{Slope} = - \frac{E_a}{R}$$

$$-5 \times 10^3 = \frac{-E_a}{8.314}$$

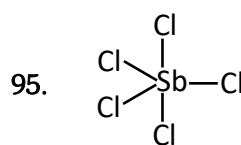
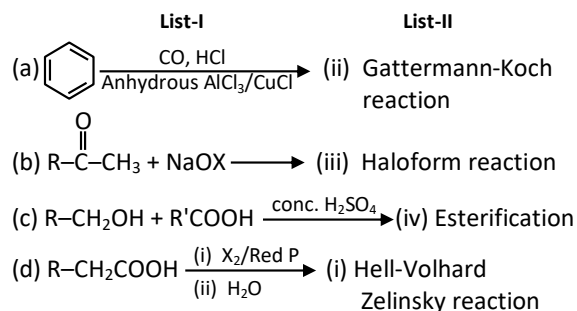
$$E_a = 5 \times 10^3 \times 8.314$$

$$= 41500 \text{ J mol}^{-1} \text{ or } 41.5 \text{ kJ mol}^{-1}$$



NaBH_4 reduces aldehyde/ketone but does not reduce ester.

- 94.



sp^3d
Trigonal bipyramidal

Dipole moment (μ) = 0
Non-polar

96. Total no. of e^-
 $_{26}\text{Fe} \rightarrow 3d^6 4s^2$, $\text{Fe}^{+2} \rightarrow 3d^6$ 24
 $_{25}\text{Mn} \rightarrow 3d^5 4s^2$, $\text{Mn}^{+2} \rightarrow 3d^5$ 23

97. $\frac{n_B}{n_O} = \frac{3}{2}$
 $n_B = 3$, $n_O = 2$
 $n_{\text{Total}} = 3 + 2 = 5$

$$X_B = \frac{n_B}{n_T} = \frac{3}{5}$$

$$X_O = \frac{n_O}{n_T} = \frac{2}{5}$$

$$P_s = P_B^\circ \times_B + P_O^\circ \times_O$$

$$P_s = 280 \times \frac{3}{5} + 420 \times \frac{2}{5}$$

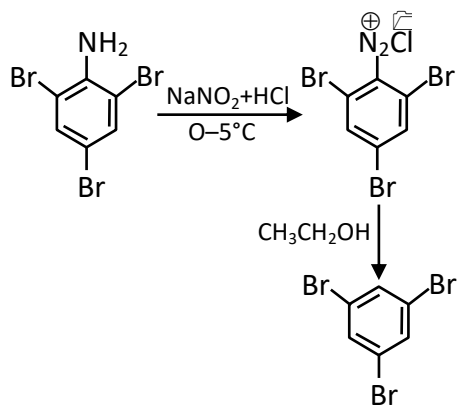
$$= 336 \text{ mm of Hg}$$

98. List-I

List-II

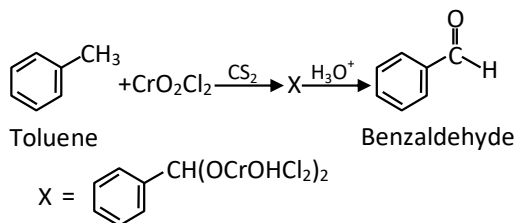
- (a) $2\text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{SO}_3(\text{g})$ (iv) Tropospheric pollution
 (b) $\text{HOCl}(\text{g}) \xrightarrow{h\nu} \dot{\text{O}}\text{H} + \dot{\text{Cl}}$ (iii) Ozone depletion
 (c) $\text{CaCO}_3 + \text{H}_2\text{SO}_4 \rightarrow$ (i) Acid rain
 $\text{CaSO}_4 + \text{H}_2\text{O} + \text{CO}_2$
 (d) $\text{NO}_2(\text{g}) \xrightarrow{h\nu} \text{NO}(\text{g}) + \text{O}(\text{g})$ (ii) Smog

99.

R : $\text{CH}_3\text{CH}_2\text{OH}$

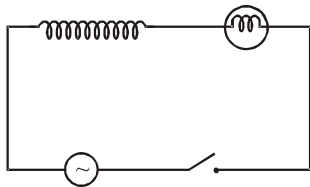
Certain mild reducing agents like hypophosphorous acid or ethanol reduce diazonium salts to arene and themselves get oxidised to phosphorous acid and ethanal respectively.

100.



NEET(UG) – 2020(COVID-19)

- The E.M. wave with shortest wavelength among the following is
 - Ultraviolet rays
 - X-rays
 - Gamma-rays
 - Microwaves
- The angular speed of the wheel of a vehicle is increased from 360 rpm to 1200 rpm in 14 second. Its angular acceleration is
 - $2\pi \text{ rad/s}^2$
 - $28\pi \text{ rad/s}^2$
 - $120\pi \text{ rad/s}^2$
 - 1 rad/s^2
- What happens to the mass number and atomic number of an element when it emits γ -radiation?
 - Mass number decreases by four and atomic number decreases by two.
 - Mass number and atomic number remain unchanged.
 - Mass number remains unchanged while atomic number decreases by one.
 - Mass number increases by four and atomic number increases by two.
- The angle of 1' (minute of arc) in radian is nearly equal to
 - $2.91 \times 10^{-4} \text{ rad}$
 - $4.85 \times 10^{-4} \text{ rad}$
 - $4.80 \times 10^{-6} \text{ rad}$
 - $1.75 \times 10^{-2} \text{ rad}$
- The magnetic flux linked with a coil (in Wb) is given by the equation $\phi = 5t^2 + 3t + 16$. The magnitude of induced emf in the coil at the fourth second will be
 - 33 V
 - 43 V
 - 108 V
 - 10 V
- The electric field at a point on the equatorial plane at a distance r from the centre of a dipole having dipole moment \vec{p} is given by ($r \gg$ separation of two charges forming the dipole, ϵ_0 - permittivity of free space)
 - $\vec{E} = \frac{\vec{p}}{4\pi\epsilon_0 r^3}$
 - $\vec{E} = \frac{2\vec{p}}{4\pi\epsilon_0 r^3}$
 - $\vec{E} = -\frac{\vec{p}}{4\pi\epsilon_0 r^2}$
 - $\vec{E} = -\frac{\vec{p}}{4\pi\epsilon_0 r^3}$
- A plano-convex lens of unknown material and unknown focal length is given. With the help of a spherometer we can measure the
 - focal length of the lens
 - radius of curvature of the curved surface
 - aperture of the lens
 - refractive index of the material
- A light bulb and an inductor coil are connected to an ac source through a key as shown in the figure below. The key is closed and after sometime an iron rod is inserted into the interior of the inductor. The glow of the light bulb



 - decreases
 - remains unchanged
 - will fluctuate
 - increases
- The efficiency of a Carnot engine depends upon
 - the temperature of the sink only
 - the temperatures of the source and sink
 - the volume of the cylinder of the engine
 - the temperature of the source only

10. Out of the following which one is a forward biased diode ?

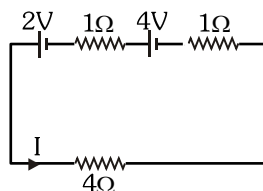
(1) 

(2) 

(3) 

(4) 

11. For the circuit shown in the figure, the current I will be



- (1) 0.75 A (2) 1 A (3) 1.5 A (4) 0.5 A
12. Two coherent sources of light interfere and produce fringe pattern on a screen. For central maximum, the phase difference between the two waves will be

(1) zero (2) π (3) $3\pi/2$ (4) $\pi/2$

13. The total energy of an electron in the n^{th} stationary orbit of the hydrogen atom can be obtained by

(1) $E_n = \frac{13.6}{n^2} \text{ eV}$ (2) $E_n = -\frac{13.6}{n^2} \text{ eV}$

(3) $E_n = -\frac{1.36}{n^2} \text{ eV}$ (4) $E_n = -13.6 \times n^2 \text{ eV}$

14. Identify the function which represents a periodic motion

(1) $e^{\omega t}$ (2) $\log_e(\omega t)$

(3) $\sin \omega t + \cos \omega t$ (4) $e^{-\omega t}$

15. The de Broglie wavelength of an electron moving with kinetic energy of 144 eV is nearly

(1) $102 \times 10^{-3} \text{ nm}$ (2) $102 \times 10^{-4} \text{ nm}$

(3) $102 \times 10^{-5} \text{ nm}$ (4) $102 \times 10^{-2} \text{ nm}$

16. The mean free path ℓ for a gas molecule depends upon diameter, d of the molecule as :

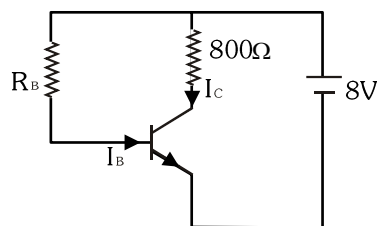
(1) $\ell \propto \frac{1}{d^2}$

(2) $\ell \propto d$

(3) $\ell \propto d^2$

(4) $\ell \propto \frac{1}{d}$

17. A n-p-n transistor is connected in common emitter configuration (see figure) in which collector voltage drop across load resistance (800Ω) connected to the collector circuit is 0.8 V. The collector current is :



(1) 2 mA

(2) 0.1 mA

(3) 1 mA

(4) 0.2 mA

18. A person sitting in the ground floor of a building notices through the window, of height 1.5 m, a ball dropped from the roof of the building crosses the window in 0.1 s. What is the velocity of the ball when it is at the topmost point of the window ?

($g = 10 \text{ m/s}^2$)

(1) 15.5 m/s

(2) 14.5 m/s

(3) 4.5 m/s

(4) 20 m/s

19. The magnetic field in a plane electromagnetic wave is given by :

$B_y = 2 \times 10^{-7} \sin(\pi \times 10^3 x + 3\pi \times 10^{11} t) \text{ T}$

Calculate the wavelength.

(1) $\pi \times 10^3 \text{ m}$

(2) $2 \times 10^{-3} \text{ m}$

(3) $2 \times 10^3 \text{ m}$

(4) $\pi \times 10^{-3} \text{ m}$

20. The length of the string of a musical instrument is 90 cm and has a fundamental frequency of 120 Hz. Where should it be pressed to produce fundamental frequency of 180 Hz ?

(1) 75 cm

(2) 60 cm

(3) 45 cm

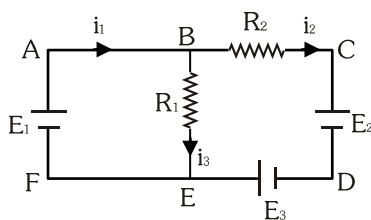
(4) 80 cm

21. The acceleration of an electron due to the mutual attraction between the electron and a proton when they are 1.6 \AA apart is,

$$(m_e \simeq 9 \times 10^{-31} \text{ kg}, e = 1.6 \times 10^{-19} \text{ C})$$

$$\left(\text{Take } \frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ Nm}^2 \text{ C}^{-2}\right)$$

- (1) 10^{24} m/s^2 (2) 10^{23} m/s^2
(3) 10^{22} m/s^2 (4) 10^{25} m/s^2
22. The wave nature of electrons was experimentally verified by,
- (1) de Broglie
(2) Hertz
(3) Einstein
(4) Davisson and Germer
23. Two solid conductors are made up of same material, have same length and same resistance. One of them has a circular cross section of area A_1 and the other one has a square cross section of area A_2 . The ratio A_1/A_2 is
- (1) 1.5 (2) 1 (3) 0.8 (4) 2
24. For the circuit given below, the Kirchoff's loop rule for the loop BCDEB is given by the equation



- (1) $-i_2 R_2 + E_2 - E_3 + i_3 R_1 = 0$
(2) $i_2 R_2 + E_2 - E_3 - i_3 R_1 = 0$
(3) $i_2 R_2 + E_2 + E_3 + i_3 R_1 = 0$
(4) $-i_2 R_2 + E_2 + E_3 + i_3 R_1 = 0$
25. Three stars A, B, C have surface temperatures T_A, T_B, T_C respectively. Star A appears bluish, star B appears reddish and star C yellowish. Hence,
- (1) $T_A > T_B > T_C$ (2) $T_B > T_C > T_A$
(3) $T_C > T_B > T_A$ (4) $T_A > T_C > T_B$

26. A liquid does not wet the solid surface if angle of contact is :

- (1) equal to 45°
(2) equal to 60°
(3) greater than 90°
(4) zero

27. A point mass 'm' is moved in a vertical circle of radius 'r' with the help of a string. The velocity of the mass is $\sqrt{7gr}$ at the lowest point. The tension in the string at the lowest point is :

- (1) 6 mg (2) 7 mg (3) 8 mg (4) 1 mg

28. An object is placed on the principal axis of a concave mirror at a distance of $1.5 f$ (f is the focal length). The image will be at,

- (1) $-3 f$ (2) $1.5 f$
(3) $-1.5 f$ (4) $3 f$

29. The half life of radioactive sample undergoing α -decay is $1.4 \times 10^{17} \text{ s}$. If the number of nuclei in the sample is 2.0×10^{21} , the activity of the sample is nearly :

- (1) 10^4 Bq (2) 10^5 Bq
(3) 10^6 Bq (4) 10^3 Bq

30. If the critical angle for total internal reflection from a medium to vacuum is 45° , then velocity of light in the medium is,

- (1) $1.5 \times 10^8 \text{ m/s}$ (2) $\frac{3}{\sqrt{2}} \times 10^8 \text{ m/s}$
(3) $\sqrt{2} \times 10^8 \text{ m/s}$ (4) $3 \times 10^8 \text{ m/s}$

31. A wheel with 20 metallic spokes each 1 m long is rotated with a speed of 120 rpm in a plane perpendicular to a magnetic field of 0.4 G. The induced emf between the axle and rim of the wheel will be, ($1 \text{ G} = 10^{-4} \text{ T}$)

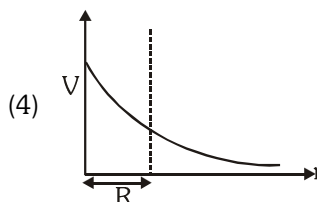
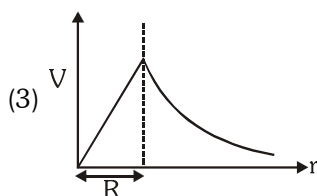
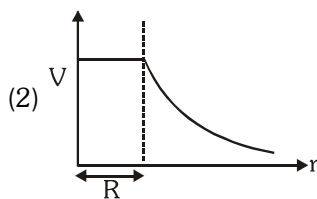
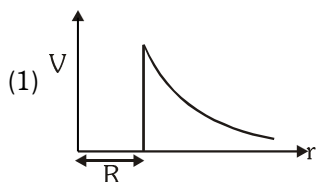
- (1) $2.51 \times 10^{-4} \text{ V}$
(2) $2.51 \times 10^{-5} \text{ V}$
(3) $4.0 \times 10^{-5} \text{ V}$
(4) 2.51 V

32. An ideal gas equation can be written as $P = \frac{\rho RT}{M_0}$

where ρ and M_0 are respectively,

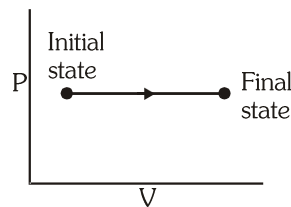
- (1) mass density, mass of the gas
- (2) number density, molar mass
- (3) mass density, molar mass
- (4) number density, mass of the gas

33. The variation of electrostatic potential with radial distance r from the centre of a positively charged metallic thin shell of radius R is given by the graph



34. Which of the following gate is called universal gate?
- (1) OR gate
 - (2) AND gate
 - (3) NAND gate
 - (4) NOT gate

35. The P-V diagram for an ideal gas in a piston cylinder assembly undergoing a thermodynamic process is shown in the figure. The process is



- (1) adiabatic
 - (2) isochoric
 - (3) isobaric
 - (4) isothermal
36. The power of a biconvex lens is 10 dioptre and the radius of curvature of each surface is 10 cm. Then the refractive index of the material of the lens is,
- (1) $\frac{4}{3}$
 - (2) $\frac{9}{8}$
 - (3) $\frac{5}{3}$
 - (4) $\frac{3}{2}$
37. An intrinsic semiconductor is converted into n-type extrinsic semiconductor by doping it with :-
- (1) Phosphorous
 - (2) Aluminium
 - (3) Silver
 - (4) Germanium
38. A barometer is constructed using a liquid (density = 760 kg/m^3). What would be the height of the liquid column, when a mercury barometer reads 76 cm ?

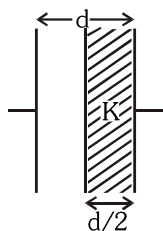
(density of mercury = 13600 kg/m^3)

- (1) 1.36 m
- (2) 13.6 m
- (3) 136 m
- (4) 0.76 m

39. A wire of length L metre carrying a current of I ampere is bent in the form of a circle. Its magnetic moment is,

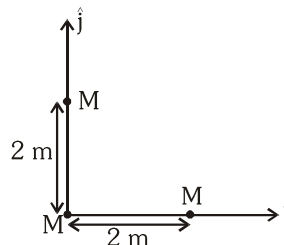
- (1) $IL^2/4 \text{ A m}^2$
 (2) $I\pi L^2/4 \text{ A m}^2$
 (3) $2IL^2/\pi \text{ A m}^2$
 (4) $IL^2/4\pi \text{ A m}^2$

40. A parallel plate capacitor having cross-sectional area A and separation d has air in between the plates. Now an insulating slab of same area but thickness $d/2$ is inserted between the plates as shown in figure having dielectric constant $K(= 4)$. The ratio of new capacitance to its original capacitance will be,

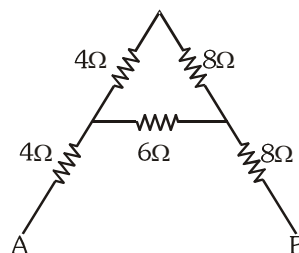


- (1) 2 : 1 (2) 8 : 5
 (3) 6 : 5 (4) 4 : 1
41. What is the depth at which the value of acceleration due to gravity becomes $1/n$ times the value that at the surface of earth?
 (radius of earth = R)
- (1) R/n^2 (2) $R(n-1)/n$
 (3) $Rn/(n-1)$ (4) R/n
42. Time intervals measured by a clock give the following readings :
 1.25 s, 1.24 s, 1.27 s, 1.21 s and 1.28 s.
 What is the percentage relative error of the observations ?
- (1) 2 % (2) 4 %
 (3) 16 % (4) 1.6 %

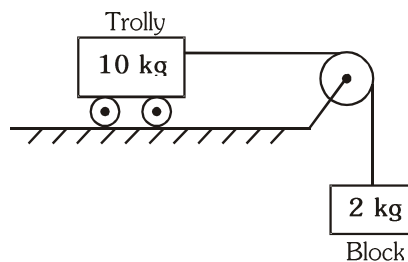
43. Three identical spheres, each of mass M , are placed at the corners of a right angle triangle with mutually perpendicular sides equal to 2 m (see figure). Taking the point of intersection of the two mutually perpendicular sides as the origin, find the position vector of centre of mass.



- (1) $2(\hat{i} + \hat{j})$ (2) $(\hat{i} + \hat{j})$
 (3) $\frac{2}{3}(\hat{i} + \hat{j})$ (4) $\frac{4}{3}(\hat{i} + \hat{j})$
44. The equivalent resistance between A and B for the mesh shown in the figure is



- (1) 7.2Ω (2) 16Ω (3) 30Ω (4) 4.8Ω
45. Calculate the acceleration of the block and trolley system shown in the figure. The coefficient of kinetic friction between the trolley and the surface is 0.05 . ($g = 10 \text{ m/s}^2$, mass of the string is negligible and no other friction exists).



- (1) 1.25 m/s^2 (2) 1.50 m/s^2
 (3) 1.66 m/s^2 (4) 1.00 m/s^2

46. Which of the following statement is **NOT** true about acid rain ?

- (1) It is due to reaction of SO_2 , NO_2 and CO_2 with rain water
- (2) Causes no damage to monuments like Taj Mahal.
- (3) It is harmful for plants.
- (4) Its pH is less than 5.6

47. The oxidation number of the underlined atom in the following species

- (1) $\text{Cu}_2\underline{\text{O}}$ is -1 (2) $\underline{\text{Cl}}\text{O}_3^-$ is +5
- (3) $\text{K}_2\underline{\text{Cr}}_2\text{O}_7$ is + 6 (4) $\text{H}\underline{\text{Au}}\text{Cl}_4$ is +3

Identify the incorrect option.

48. Reaction of propanamide with ethanolic sodium hydroxide and bromine will give

- (1) Ethylamine (2) Methylamine
- (3) Propylamine (4) Aniline

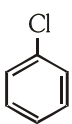
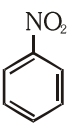

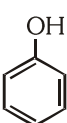
49. A liquid compound (x) can be purified by steam distillation only if it is

- (1) Steam volatile, immiscible with water
- (2) Not steam volatile, miscible with water
- (3) Steam volatile, miscible with water
- (4) Not steam volatile, immiscible with water

50. Among the compounds shown below which one revealed a linear structure ?

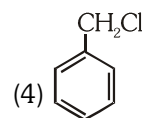
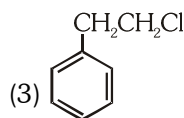
- (1) NO_2 (2) HOCl
- (3) O_3 (4) N_2O

51. Which of the following compound is most reactive in electrophilic aromatic substitution ?

- (1) 
- (2) 
- (3) 
- (4) 

52. Which of the following will **NOT** undergo $\text{S}_{\text{N}}1$ reaction with OH^- ?

- (1) $\text{CH}_2=\text{CH}-\text{CH}_2\text{Cl}$ (2) $(\text{CH}_3)_3\text{CCl}$



53. Which of the following is **not** true about chloramphenicol ?

- (1) It inhibits the growth of only gram positive bacteria.
- (2) It is a broad spectrum antibiotic.
- (3) It is not bactericidal.
- (4) It is bacteriostatic.

54. Which of the following statement is correct about Bakelite ?

- (1) It is a cross linked polymer.
- (2) It is an addition polymer.
- (3) It is a branched chain polymer.
- (4) It is a linear polymer.

55. If for a certain reaction $\Delta_r H$ is 30 kJ mol^{-1} at 450 K, the value of $\Delta_r S$ (in $\text{JK}^{-1} \text{ mol}^{-1}$) for which the same reaction will be spontaneous at the same temperature is

- (1) 70 (2) -33
- (3) 33 (4) -70

56. Match the element in column I with that in column II.

Column-I	Column-II
(a) Copper	(i) Non-metal
(b) Fluorine	(ii) Transition metal
(c) Silicon	(iii) Lanthanoid
(d) Cerium	(iv) Metalloid

Identify the correct match :

- (1) (a)-(ii), (b)-(iv), (c)-(i), (d)-(iii)
- (2) (a)-(ii), (b)-(i), (c)-(iv), (d)-(iii)
- (3) (a)-(iv), (b)-(iii), (c)-(i), (d)-(ii)
- (4) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)

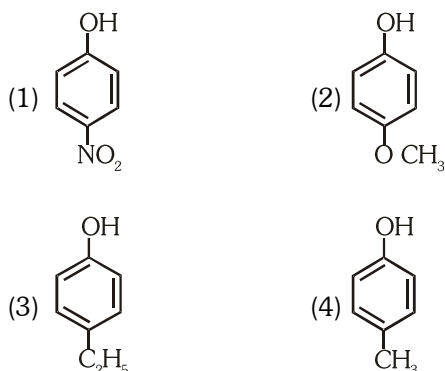
57. Which of the following is a free radical substitution reaction ?

- (1) Benzene with $\text{Br}_2/\text{AlCl}_3$
- (2) Acetylene with HBr
- (3) Methane with $\text{Br}_2/h\nu$
- (4) Propene with $\text{HBr}/(\text{C}_6\text{H}_5\text{COO})_2$

58. The reaction of concentrated sulphuric acid with carbohydrates ($\text{C}_{12}\text{H}_{22}\text{O}_{11}$) is an example of

- (1) Dehydration
- (2) Oxidation
- (3) Reduction
- (4) Sulphonation

59. Which of the following substituted phenols is the strongest acid?



60. Match the compounds of Xe in column I with the molecular structure in column II.

Column-I	Column-II
(a) XeF_2	(i) Square planar
(b) XeF_4	(ii) Linear
(c) XeO_3	(iii) Square pyramidal
(d) XeOF_4	(iv) Pyramidal
(1) (a)-(ii) (b)-(i) (c)-(iii) (d)-(iv)	
(2) (a)-(ii) (b)-(iv) (c)-(iii) (d)-(i)	
(3) (a)-(ii) (b)-(iii) (c)-(i) (d)-(iv)	
(4) (a)-(ii) (b)-(i) (c)-(iv) (d)-(iii)	

61. The half-life for a zero order reaction having 0.02 M initial concentration of reactant is 100 s. The rate constant (in $\text{mol L}^{-1} \text{s}^{-1}$) for the reaction is

- (1) 1.0×10^{-4}
- (2) 2.0×10^{-4}
- (3) 2.0×10^{-3}
- (4) 1.0×10^{-2}

62. Identify the **incorrect** statement from the following:

- (1) Zirconium and Hafnium have identical radii of 160 pm and 159 pm, respectively as a consequence of lanthanoid contraction.
- (2) Lanthanoids reveal only +3 oxidation state.
- (3) The lanthanoid ions other than the f^0 type and the f^{14} type are all paramagnetic.
- (4) The overall decrease in atomic and ionic radii from lanthanum to lutetium is called lanthanoid contraction.

63. Match the following aspects with the respective metal.

Aspects	Metal
(a) The metal which reveals a maximum number of oxidation states	(i) Scandium
(b) The metal although placed in 3d block is considered not as a transition element	(ii) Copper
(c) The metal which does not exhibit variable oxidation states	(iii) Manganese
(d) The metal which in +1 oxidation state in aqueous solution undergoes disproportionation	(iv) Zinc

Select the correct option :

- (1) (a)-(i) (b)-(iv) (c)-(ii) (d)-(iii)
- (2) (a)-(iii) (b)-(iv) (c)-(i) (d)-(ii)
- (3) (a)-(iii) (b)-(i) (c)-(iv) (d)-(ii)
- (4) (a)-(ii) (b)-(iv) (c)-(i) (d)-(iii)

64. If 8g of a non-electrolyte solute is dissolved in 114 g of n-octane to reduce its vapour pressure to 80%, the molar mass (in g mol^{-1}) of the solute is [Given that molar mass of n-octane is 114 g mol^{-1}]
 (1) 40 (2) 60 (3) 80 (4) 20

65. Match the coordination number and type of hybridisation with distribution of hybrid orbitals in space based on Valence bond theory.

Coordination number and type of hybridisation	Distribution of hybrid orbitals in space
(a) 4, sp^3	(i) trigonal bipyramidal
(b) 4, dsp^2	(ii) octahedral
(c) 5, sp^3d	(iii) tetrahedral
(d) 6, d^2sp^3	(iv) square planar

Select the correct option :

- (1) (a)-(ii) (b)-(iii) (c)-(iv) (d)-(i)
 (2) (a)-(iii) (b)-(iv) (c)-(i) (d)-(ii)
 (3) (a)-(iv) (b)-(i) (c)-(ii) (d)-(iii)
 (4) (a)-(iii) (b)-(i) (c)-(iv) (d)-(ii)
66. The number of angular nodes and radial nodes in 3s orbital are
 (1) 0 and 2, respectively
 (2) 1 and 0, respectively
 (3) 3 and 0, respectively
 (4) 0 and 1, respectively
67. Identify the correct statement from the following.
 (1) The order of hydration enthalpies of alkaline earth cations
 $\text{Be}^{2+} < \text{Mg}^{2+} < \text{Ca}^{2+} < \text{Sr}^{2+} < \text{Ba}^{2+}$
 (2) Lithium and Magnesium show some similarities in their physical properties as they are diagonally placed in periodic table.
 (3) Lithium is softer among all alkali metals.
 (4) Lithium chloride is deliquescent and crystallises as a hydrate, $\text{LiCl} \cdot \text{H}_2\text{O}$.
68. Deficiency of which vitamin causes osteomalacia?
 (1) Vitamin A (2) Vitamin D
 (3) Vitamin K (4) Vitamin E

69. Identify the wrongly matched pair.

Molecule	Shape or geometry of molecule
(1) PCl_5	Trigonal planar
(2) SF_6	Octahedral
(3) BeCl_2	Linear
(4) NH_3	Trigonal pyramidal

70. $\text{CH}_3\text{CH}_2\text{CH} = \text{CH}_2 \xrightarrow[\text{H}_2\text{O}, \text{H}_2\text{O}_2, \text{OH}^-]{\text{B}_2\text{H}_6} \text{Z}$

What is Z ?

- (1) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$
 (2) $\text{CH}_3\text{CH}_2\underset{\text{OH}}{\text{CH}}\text{CH}_3$
 (3) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CHO}$
 (4) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$
71. Identify the reaction from following having top position in EMF series (Std. red. potential) according to their electrode potential at 298 K.
 (1) $\text{Mg}^{2+} + 2\text{e}^- \rightarrow \text{Mg}_{(\text{s})}$
 (2) $\text{Fe}^{2+} + 2\text{e}^- \rightarrow \text{Fe}_{(\text{s})}$
 (3) $\text{Au}^{3+} + 3\text{e}^- \rightarrow \text{Au}_{(\text{s})}$
 (4) $\text{K}^+ + 1\text{e}^- \rightarrow \text{K}_{(\text{s})}$
72. Match the elements in Column I with methods of purification in Column II.

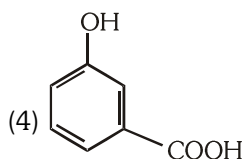
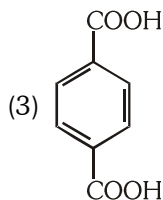
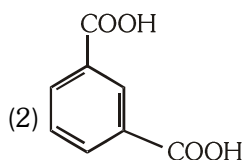
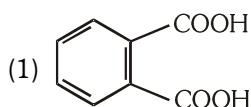
Column I	Column II
(a) Boron	(i) Van Arkel method
(b) Tin	(ii) Mond's process
(c) Zirconium	(iii) Liquefaction
(d) Nickel	(iv) Zone refining
(1) (a)-(iv) (b)-(iii) (c)-(i) (d)-(ii)	
(2) (a)-(iv) (b)-(iii) (c)-(ii) (d)-(i)	
(3) (a)-(ii) (b)-(i) (c)-(iv) (d)-(iii)	
(4) (a)-(iii) (b)-(iv) (c)-(i) (d)-(ii)	

73. Which among the following salt solutions is basic in nature ?
 (1) Ammonium chloride
 (2) Ammonium sulphate
 (3) Ammonium nitrate
 (4) Sodium acetate

74. In which of the sols, the colloidal particles are with negative charge ?

- (1) TiO_2
- (2) Haemoglobin
- (3) Starch
- (4) Hydrated Al_2O_3

75. Which of the following acid will form an (a) Anhydride on heating and (b) Acid imide on strong heating with ammonia ?



76. In a typical fuel cell, the reactants (R) and product (P) are :-

- (1) $\text{R} = \text{H}_{2(g)}$, $\text{O}_{2(g)}$; $\text{P} = \text{H}_2\text{O}_{2(l)}$
- (2) $\text{R} = \text{H}_{2(g)}$, $\text{O}_{2(g)}$; $\text{P} = \text{H}_2\text{O}_{(l)}$
- (3) $\text{R} = \text{H}_{2(g)}$, $\text{O}_{2(g)}$, $\text{Cl}_{2(g)}$; $\text{P} = \text{HClO}_{4(aq)}$
- (4) $\text{R} = \text{H}_{2(g)}$, $\text{N}_{2(g)}$; $\text{P} = \text{NH}_{3(aq)}$

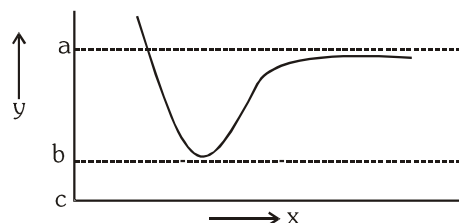
77. In collision theory of chemical reaction, Z_{AB} represents

- (1) the fraction of molecules with energies greater than E_a
- (2) the collision frequency of reactants, A and B
- (3) steric factor
- (4) the fraction of molecules with energies equal to E_a

78. Which of the following statement is **not** true about glucose ?

- (1) It is an aldohexose.
- (2) It contains five hydroxyl groups.
- (3) It is a reducing sugar.
- (4) It is an aldopentose.

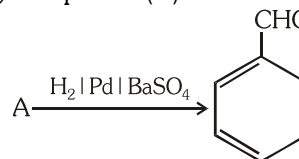
79. The potential energy (y) curve for H_2 formation as a function of internuclear distance (x) of the H atoms is shown below.



The bond energy of H_2 is :

- (1) $(b - a)$
- (2) $\frac{(c - a)}{2}$
- (3) $\frac{(b - a)}{2}$
- (4) $(c - a)$

80. Identify compound (A) in the following reaction :



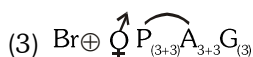
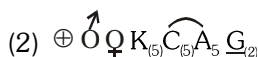
- (1) Benzoyl chloride
- (2) Toluene
- (3) Acetophenone
- (4) Benzoic acid

91. In some plants thalamus contributes to fruit formation. Such fruits are termed as :
 (1) False fruits
 (2) Aggregate fruits
 (3) True fruits
 (4) Parthenocarpic fruit
92. First discovered restriction endonuclease that always cuts DNA molecule at a particular point by recognising a specific sequence of six base pairs is:
 (1) EcoR1
 (2) Adenosine deaminase
 (3) Thermostable DNA polymerase
 (4) Hind II
93. Which of the following statements is **incorrect**?
 (1) Biomass decreases from first to fourth trophic level
 (2) Energy content gradually increases from first to fourth trophic level
 (3) Number of individuals decreases from first trophic level to fourth trophic level
 (4) Energy content gradually decreases from first to fourth trophic level
94. The term 'Nuclein' for the genetic material was used by :
 (1) Franklin (2) Meischer
 (3) Chargaff (4) Mendel
95. Chromosomal theory of inheritance was proposed by :
 (1) Sutton and Boveri
 (2) Bateson and Punnett
 (3) T. H. Morgan
 (4) Watson and Crick
96. Phycoerythrin is the major pigment in :
 (1) Red algae (2) Blue green algae
 (3) Green algae (4) Brown algae
97. Identify the statement which is **incorrect**.
 (1) Sulphur is an integral part of cysteine.
 (2) Glycine is an example of lipids.
 (3) Lecithin contains phosphorus atom in its structure.
 (4) Tyrosine possesses aromatic ring in its structure.
98. Which of the following statements is incorrect about gymnosperms ?
 (1) They are heterosporous
 (2) Male and female gametophytes are free living
 (3) Most of them have narrow leaves with thick cuticle
 (4) Their seeds are not covered
99. A species which was introduced for ornamentation but has become a trouble-some weed in India :
 (1) *Parthenium hysterophorus*
 (2) *Eichhornia crassipes*
 (3) *Prosopis juliflora*
 (4) *Trapa spinosa*
100. Correct position of floral parts over thalamus in mustard plant is :
 (1) Gynoecium occupies the highest position, while the other parts are situated below it.
 (2) Margin of the thalamus grows upward, enclosing the ovary completely, and other parts arise below the ovary.
 (3) Gynoecium is present in the centre and other parts cover it partially.
 (4) Gynoecium is situated in the centre, and other parts of the flower are located at the rim of the thalamus, at the same level.
101. In Recombinant DNA technology antibiotics are used :
 (1) to keep medium bacteria-free
 (2) to detect alien DNA
 (3) to impart disease-resistance to the host plant
 (4) as selectable markers
102. According to Alexander von Humboldt :
 (1) Species richness decreases with increasing area of exploration
 (2) Species richness increases with increasing area, but only up to limit
 (3) There is no relationship between species richness and area explored.
 (4) Species richness goes on increasing with increasing area of exploration

103. Which of the following is **incorrect** for wind-pollinated plants ?

- (1) Well exposed stamens and stigma
- (2) Many ovules in each ovary
- (3) Flowers are small and not brightly coloured
- (4) Pollen grains are light and non-sticky

104. Which of the following is the correct floral formula of Liliaceae ?



105. In the polynucleotide chain of DNA, a nitrogenous base is linked to the –OH of:

- (1) 2'C pentose sugar
- (2) 3'C pentose sugar
- (3) 5'C pentose sugar
- (4) 1'C pentose sugar

106. In *Glycine max*, the product of biological nitrogen fixation is transported from the root nodules to other parts as :

- (1) Ammonia
- (2) Glutamate
- (3) Nitrates
- (4) Ureides

107. The number of contrasting characters studied by Mendel for his experiments was:

- (1) 14
- (2) 4
- (3) 2
- (4) 7

108. Attachment of spindle fibers to kinetochores of chromosomes becomes evident in :

- (1) Anaphase
- (2) Telophase
- (3) Prophase
- (4) Metaphase

109. Match the items in Column-I with those in Column-II :

Column I

- (a) Herbivores-Plants
- (b) Mycorrhiza-Plants
- (c) Sheep-Cattle
- (d) Orchid-Tree

Column II

- (i) Commensalism
- (ii) Mutualism
- (iii) Predation
- (iv) Competition

Select the correct option from following :

- (1) (a)-(iv), (b)-(ii), (c)-(i), (d)-(iii)
- (2) (a)-(iii), (b)-(ii), (c)-(iv), (d)-(i)
- (3) (a)-(ii), (b)-(i), (c)-(iii), (d)-(iv)
- (4) (a)-(i), (b)-(iii), (c)-(iv), (d)-(ii)

110. Vegetative propagule in *Agave* is termed as:

- (1) Rhizome
- (2) Bulbil
- (3) Offset
- (4) Eye

111. Match the following :

- (a) Aquaporin
- (b) Asparagine
- (c) Absciscic acid
- (d) Chitin
- (i) Amide
- (ii) Polysaccharide
- (iii) Polypeptide
- (iv) Carotenoids

Select the correct option :

- (1) (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii)
- (2) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)
- (3) (a)-(ii), (b)-(i), (c)-(iv), (d)-(iii)
- (4) (a)-(iii), (b)-(i), (c)-(ii), (d)-(iv)

112. Which of the following elements helps in maintaining the structure of ribosomes ?

- (1) Magnesium
- (2) Zinc
- (3) Copper
- (4) Molybdenum

113. Who coined the term 'Kinetin' ?

- (1) Skoog and Miller
- (2) Darwin
- (3) Went
- (4) Kurosawa

114. In the following in each set a conservation approach and an example of method of conservation are given

- (a) In situ conservation - Biosphere Reserve
- (b) Ex situ conservation - Sacred groves
- (c) In situ conservation - Seed bank
- (d) Ex situ conservation - Cryopreservation

Select the option with correct match of approach and method :

- (1) (a) and (c)
- (2) (a) and (d)
- (3) (b) and (d)
- (4) (a) and (b)

115. Embryological support for evolution was proposed by :

- (1) Ernst Heckel
- (2) Karl Ernst von Baer
- (3) Charles Darwin
- (4) Alfred Wallace

116. During non-cyclic photophosphorylation, when electrons are lost from the reaction centre at PS II, what is the source which replaces these electrons?

- (1) Oxygen
- (2) Water
- (3) Carbon dioxide
- (4) Light

- 117.** In a mitotic cycle, the correct sequence of phases is
- (1) S, G₁, G₂, M (2) G₁, S, G₂, M
(3) M, G₁, G₂, S (4) G₁, G₂, S, M
- 118.** Inclusion bodies of blue- green, purple and green photosynthetic bacteria are :
- (1) Contractile vacuoles
(2) Gas vacuoles
(3) Centrioles
(4) Microtubules
- 119.** Large, empty colourless cells of the adaxial epidermis along the veins of grass leaves are
- (1) Lenticels
(2) Guard cells
(3) Bundle sheath cells
(4) Bulliform cells
- 120.** The biosynthesis of ribosomal RNA occurs in :
- (1) Ribosomes (2) Golgi apparatus
(3) Microbodies (4) Nucleolus
- 121.** Which of the following is **incorrect** about Cynobacteria ?
- (1) They are photoautotrophs
(2) They lack heterocysts
(3) They often form blooms in polluted water bodies
(4) They have chlorophyll-a similar to green plants
- 122.** Which of the following statements about cork cambium is **incorrect**?
- (1) It forms secondary cortex on its outside
(2) It forms a part of periderm
(3) It is responsible for the formation of lenticels
(4) It is a couple of layers thick
- 123.** Select the **incorrect** statement.
- (1) Transport of molecules in phloem can be bidirectional.
(2) Movement of minerals in xylem is unidirectional.
(3) Unloading of sucrose at sink does not involve the utilization of ATP.
(4) Elements most easily mobilized in plants from one region to another are: phosphorus, sulphur, nitrogen and potassium.
- 124.** Air (Prevention and Control of Pollution) Act was amended in 1987 to include among pollutants
- (1) Vehicular exhaust
(2) Allergy causing pollen
(3) Noise
(4) Particulates of size 2.5 micrometer or below
- 125.** Inhibitory substances in dormant seeds cannot be removed by subjecting seeds to :
- (1) Gibberellic acid (2) Nitrate
(3) Ascorbic acid (4) Chilling conditions
- 126.** Match the following techniques or instruments with their usage :
- | | |
|---------------------|---|
| (a) Bioreactor | (i) Separation of DNA fragments |
| (b) Electrophoresis | (ii) Production of large quantities of products |
| (c) PCR | (iii) Detection of pathogen, based on antigen – antibody reaction |
| (d) ELISA | (iv) Amplification of nucleic acids |
- Select the correct option from following:
- (1) (a)-(iii), (b)-(ii), (c)-(iv), (d)-(i)
(2) (a)-(ii), (b)-(i), (c)-(iv), (d)-(iii)
(3) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)
(4) (a)-(ii), (b)-(i), (c)-(iii), (d)-(iv)
- 127.** Which of the following statements is **incorrect**?
- (1) RuBisCO is a bifunctional enzyme
(2) In C₄ plants, the site of RuBisCO activity is mesophyll cell
(3) The substrate molecule for RuBisCO activity is a 5-carbon compound
(4) RuBisCO action requires ATP and NADPH
- 128.** Which of the following statements is incorrect regarding the phosphorus cycle?
- (1) Phosphates are the major form of phosphorus reservoir
(2) Phosphorus solubilising bacteria facilitate the release of phosphorus from organic remains
(3) There is appreciable respiratory release of phosphorus into atmosphere
(4) It is sedimentary cycle

- 129.** After about how many years of formation of earth, life appeared on this planet ?
 (1) 500 billion years
 (2) 50 million years
 (3) 500 million years
 (4) 50 billion years
- 130.** In a mixture, DNA fragments are separated by :-
 (1) Bioprocess engineering
 (2) Restriction digestion
 (3) Electrophoresis
 (4) Polymerase chain reaction
- 131.** Identify the correct features of Mango and Coconut fruits.
 (i) In both fruit is a drupe
 (ii) Endocarp is edible in both
 (iii) Mesocarp in Coconut is fibrous, and in Mango it is fleshy
 (iv) In both, fruit develops from monocarpellary ovary
 Select the correct option from below :
 (1) (i), (iii) and (iv) only (2) (i), (ii) and (iii) only
 (3) (i) and (iv) only (4) (i) and (ii) only
- 132.** The impact of immigration on population density is :-
 (1) Negative
 (2) Both positive and negative
 (3) Neutralized by natality
 (4) Positive
- 133.** Male and female gametophytes do not have an independent free living existence in :-
 (1) Pteridophytes (2) Algae
 (3) Angiosperms (4) Bryophytes
- 134.** Match the following concerning the activity/function and the phytohormone involved:-
 (a) Fruit ripener (i) Absciscic acid
 (b) Herbicide (ii) GA₃
 (c) Bolting agent (iii) 2, 4-D
 (d) Stress hormone (iv) Ethephon
 Select the correct option from following :-
 (1) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)
 (2) (a)-(iii), (b)-(iv), (c)-(ii), (d)-(i)
 (3) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)
 (4) (a)-(iv), (b)-(ii), (c)-(i), (d)-(iii)
- 135.** Pyruvate dehydrogenase activity during aerobic respiration requires :-
 (1) Calcium (2) Iron
 (3) Cobalt (4) Magnesium
- 136.** The rate of decomposition is faster in the ecosystem due to following factors EXCEPT:
 (1) Detritus rich in sugars
 (2) Warm and moist environment
 (3) Presence of aerobic soil microbes
 (4) Detritus richer in lignin and chitin
- 137.** For the commercial and industrial production of Citric Acid, which of the following microbes is used ?
 (1) *Aspergillus niger*
 (2) *Lactobacillus sp*
 (3) *Saccharomyces cerevisiae*
 (4) *Clostridium butylicum*
- 138.** Which of the following STDs are **not** curable ?
 (1) Genital herpes, Hepatitis B, HIV infection
 (2) Chlamydia, Syphilis, Genital warts
 (3) HIV, Gonorrhoea, Trichomoniasis
 (4) Gonorrhoea, Trichomoniasis, Hepatitis B
- 139.** Spooling is :-
 (1) Amplification of DNA
 (2) Cutting of separated DNA bands from the agarose gel
 (3) Transfer of separated DNA fragments to synthetic membranes
 (4) Collection of isolated DNA
- 140.** The phenomenon of evolution of different species in a given geographical area starting from a point and spreading to other habitats is called :-
 (1) Saltation
 (2) Co-evolution
 (3) Natural selection
 (4) Adaptive radiation
- 141.** The best example for pleiotropy is :-
 (1) Skin colour
 (2) Phenylketoneuria
 (3) Colour Blindness
 (4) ABO Blood group

142. In cockroach, identify the parts of the foregut in correct sequence :-

- (1) Mouth → Oesophagus → Pharynx → Crop → Gizzard
- (2) Mouth → Crop → Pharynx → Oesophagus → Gizzard
- (3) Mouth → Gizzard → Crop → Pharynx → Oesophagus
- (4) Mouth → Pharynx → Oesophagus → Crop → Gizzard

143. Match the following columns and select the correct option :-

Column-I

Column-II

- | | |
|-----------------------|--------------------------|
| (a) Pituitary hormone | (i) Steroid |
| (b) Epinephrine | (ii) Neuropeptides |
| (c) Endorphins | (iii) Peptides, proteins |
| (d) Cortisol | (iv) Biogenic amines |
- (1) (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)
 - (2) (a)-(iii), (b)-(iv), (c)-(ii), (d)-(i)
 - (3) (a)-(iv), (b)-(iii), (c)-(i), (d)-(ii)
 - (4) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)

144. Which of the following options does correctly represent the characteristic features of phylum Annelida ?

- (1) Triploblastic, unsegmented body and bilaterally symmetrical.
- (2) Triploblastic, segmented body and bilaterally symmetrical.
- (3) Triploblastic, flattened body and acoelomate condition.
- (4) Diploblastic, mostly marine and radially symmetrical.

145. Match the following columns and select the correct option :-

Column-I	Column-II
(a) Dragonflies	(i) Biocontrol agents of several plant pathogens
(b) <i>Bacillus thuringiensis</i>	(ii) Get rid of Aphids and mosquitoes
(c) Glomus	(iii) Narrow spectrum insecticidal applications
(d) Baculoviruses	(iv) Biocontrol agents of lepidopteran plant pests
	(v) Absorb phosphorus from soil

- (1) (a)-(iii), (b)-(v), (c)-(iv), (d)-(i)
- (2) (a)-(ii), (b)-(i), (c)-(iii), (d)-(iv)
- (3) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(v)
- (4) (a)-(ii), (b)-(iv), (c)-(v), (d)-(iii)

146. Intrinsic factor that helps in the absorption of vitamin B₁₂ is secreted by :-

- (1) Goblet cells
- (2) Hepatic cells
- (3) Oxyntic cells
- (4) Chief cells

147. Hormones stored and released from neurohypophysis are :-

- (1) Thyroid stimulating hormone and Oxytocin
- (2) Oxytocin and Vasopressin
- (3) Follicle stimulating hormone and Leutinizing hormone
- (4) Prolactin and Vasopressin

148. Match the following columns and select the correct option :

Column - I

Column - II

- | | |
|-----------------|-----------------------------------|
| (i) Typhoid | (a) <i>Haemophilus influenzae</i> |
| (ii) Malaria | (b) <i>Wuchereria bancrofti</i> |
| (iii) Pneumonia | (c) <i>Plasmodium vivax</i> |
| (iv) Filariasis | (d) <i>Salmonella typhi</i> |

- (1) (i)-(d), (ii)-(c), (iii)-(a), (iv)-(b)
- (2) (i)-(c), (ii)-(d), (iii)-(b), (iv)-(a)
- (3) (i)-(a), (ii)-(c), (iii)-(b), (iv)-(d)
- (4) (i)-(a), (ii)-(b), (iii)-(d), (iv)-(c)

149. In human beings, at the end of 12 weeks (first trimester) of pregnancy, the following is observed:

- (1) Eyelids and eyelashes are formed
- (2) Most of the major organ systems are formed
- (3) The head is covered with fine hair
- (4) Movement of the foetus

150. Match the following columns and select the correct option :

Column - I

Column - II

- | | |
|--------------------|--|
| (a) Rods and Cones | (i) Absence of photoreceptor cells |
| (b) Blind Spot | (ii) Cones are densely packed |
| (c) Fovea | (iii) Photoreceptor cells |
| (d) Iris | (iv) Visible coloured portion of the eye |

- (1) (a)-(iii), (b)-(i), (c)-(ii), (d)-(iv)
- (2) (a)-(ii), (b)-(iii), (c)-(i), (d)-(iv)
- (3) (a)-(iii), (b)-(iv), (c)-(ii), (d)-(i)
- (4) (a)-(ii), (b)-(iv), (c)-(iii), (d)-(i)

151. The size of Pleuropneumonia - like Organism (PPLO) is :

- (1) 0.02 μm (2) 1-2 μm
(3) 10-20 μm (4) 0.1 μm

152. The proteolytic enzyme rennin is found in :

- (1) Intestinal juice (2) Bile juice
(3) Gastric juice (4) Pancreatic juice

153. Match the following group of organisms with their respective distinctive characteristics and select the correct option :

Organisms	Characteristics
(a) Platyhelminthes	(i) Cylindrical body with no segmentation
(b) Echinoderms	(ii) Warm blooded animals with direct development
(c) Hemichordates	(iii) Bilateral symmetry with incomplete digestive system
(d) Aves	(iv) Radial symmetry with indirect development

- (1) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)
(2) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)
(3) (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)
(4) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)

154. Cyclosporin A, used as immuno suppression agent, is produced from :

- (1) *Monascus purpureus*
(2) *Saccharomyces cerevisiae*
(3) *Penicillium notatum*
(4) *Trichoderma polysporum*

155. Select the correct statement from the following :

- (1) Gel electrophoresis is used for amplification of a DNA segment.
(2) The polymerase enzyme joins the gene of interest and the vector DNA.
(3) Restriction enzyme digestions are performed by incubating purified DNA molecules with the restriction enzymes of optimum conditions.
(4) PCR is used for isolation and separation of gene of interest.

156. The increase in osmolarity from outer to inner medullary interstitium is maintained due to :

- (i) Close proximity between Henle's loop and vasa recta
(ii) Counter current mechanism
(iii) Selective secretion of HCO_3^- and hydrogen ions in PCT
(iv) Higher blood pressure in glomerular capillaries

- (1) Only(ii) (2) (iii) and (iv)
(3) (i), (ii) and (iii) (4) (i) and (ii)

157. The yellowish fluid "colostrum" secreted by mammary glands of mother during the initial days of lactation has abundant antibodies (IgA) to protect the infant. This type of immunity is called as :

- (1) Passive immunity
(2) Active immunity
(3) Acquired immunity
(4) Autoimmunity

158. Match the following columns with reference to cockroach and select the correct option :

Column - I	Column - II
(a) Grinding of the food particles	(i) Hepatic caecal
(b) Secrete gastric juice	(ii) 10 th segment
(c) 10 pairs	(iii) Proventriculus
(d) Anal cerci	(iv) Spiracles
	(v) Alary muscles

- (1) (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii)
(2) (a)-(iv), (b)-(iii), (c)-(v), (d)-(ii)
(3) (a)-(i), (b)-(iv), (c)-(iii), (d)-(ii)
(4) (a)-(ii), (b)-(iii), (c)-(i), (d)-(iv)

159. RNA interference is used for which of the following purposes in the field of biotechnology ?

- (1) to develop a plant tolerant to abiotic stresses
(2) to develop a pest resistant plant against infestation by nematode
(3) to enhance the mineral usage by the plant
(4) to reduce post harvest losses

- 160.** *E.coli* has only 4.6×10^6 base pairs and completes the process of replication within 18 minutes; then the average rate of polymerisation is approximately-
- (1) 2000 base pairs/second
 - (2) 3000 base pairs/second
 - (3) 4000 base pairs/second
 - (4) 1000 base pairs/second
- 161.** Progesterone alone or in combination with estrogens can be used as a contraceptive in the form of -
- (1) Implants only
 - (2) Injections only
 - (3) Pills, injections and implants
 - (4) Pills only
- 162.** According to Central Pollution Control Board [CPCB] what size (in diameter) of particulate is responsible for causing greater harm to human health ?
- (1) 3.5 micrometers
 - (2) 2.5 micrometers
 - (3) 4.0 micrometers
 - (4) 3.0 micrometers
- 163.** The Total Lung Capacity (TLC) is the total volume of air accommodated in the lungs at the end of a forced inspiration. This includes :
- (1) RV; IC (Inspiratory Capacity); EC (Expiratory Capacity); and ERV
 - (2) RV; ERV; IC and EC
 - (3) RV; ERV; VC (Vital Capacity) and FRC (Functional Residual Capacity)
 - (4) RV (Residual Volume); ERV (Expiratory Reserve Volume); TV (Tidal Volume); and IRV (Inspiratory Reserve Volume)
- 164.** Select the correct option of haploid cells from the following groups :
- (1) Primary oocyte, Secondary oocyte, Spermatid
 - (2) Secondary spermatocyte, First polar body, Ovum
 - (3) Spermatogonia, Primary spermatocyte, Spermatid
 - (4) Primary spermatocyte, Secondary spermatocyte, Second polar body
- 165.** During Meiosis I, in which stage synapsis takes place ?
- (1) Pachytene
 - (2) Zygotene
 - (3) Diplotene
 - (4) Leptotene
- 166.** Match the following columns and select the correct option :
- | Column - I | Column - II |
|----------------------------------|------------------------|
| (a) Smooth endoplasmic reticulum | (i) Protein synthesis |
| (b) Rough endoplasmic reticulum | (ii) Lipid synthesis |
| (c) Golgi complex | (iii) Glycosylation |
| (d) Centriole | (iv) Spindle formation |
- (1) (a)-(ii), (b)-(i), (c)-(iii), (d)-(iv)
 - (2) (a)-(iii), (b)-(i), (c)-(ii), (d)-(iv)
 - (3) (a)-(iv), (b)-(ii), (c)-(i), (d)-(iii)
 - (4) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)
- 167.** Select the correct statement :
- (1) Atrial Natriuretic Factor increases the blood pressure.
 - (2) Angiotensin II is a powerful vasodilator.
 - (3) Counter current pattern of blood flow is not observed in vasa recta.
 - (4) Reduction in Glomerular Filtration Rate activates JG cells to release renin.
- 168.** Which of the following is associated with decrease in cardiac output ?
- (1) Sympathetic nerves
 - (2) Parasympathetic neural signals
 - (3) Pneumotaxic centre
 - (4) Adrenal medullary hormones
- 169.** Inbreeding depression is -
- (1) Reduced motility and immunity due to close inbreeding
 - (2) Decreased productivity due to mating of superior male and inferior female
 - (3) Decrease in body mass of progeny due to continued close inbreeding
 - (4) Reduced fertility and productivity due to continued close inbreeding
- 170.** Select the **incorrectly** matched pair from following:
- (1) Chondrocytes - Smooth muscle cells
 - (2) Neurons - Nerve cells
 - (3) Fibroblast - Areolar tissue
 - (4) Osteocytes - Bone cells
- 171.** The laws and rules to prevent unauthorised exploitation of bio-resources are termed as -
- (1) Biopatenting
 - (2) Bioethics
 - (3) Bioengineering
 - (4) Biopiracy

- 172.** Match the following columns and select the correct option :

Column - I	Column - II
(a) Ovary	(i) Human chorionic Gonadotropin
(b) Placenta	(ii) Estrogen & Progesterone
(c) Corpus luteum	(iii) Androgens
(d) Leydig cells	(iv) Progesterone only
(1) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)	
(2) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)	
(3) (a)-(i), (b)-(iii), (c)-(ii), (d)-(iv)	
(4) (a)-(ii), (b)-(i), (c)-(iv), (d)-(iii)	

- 173.** Match the following columns and select the correct option :

Column - I	Column - II
(a) <i>Aptenodytes</i>	(i) Flying fox
(b) <i>Pteropus</i>	(ii) Angel fish
(c) <i>Pterophyllum</i>	(iii) Lamprey
(d) <i>Petromyzon</i>	(iv) Penguin
(1) (a)-(iii), (b)-(iv), (c)-(ii), (d)-(i)	
(2) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)	
(3) (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)	
(4) (a)-(ii), (b)-(i), (c)-(iv), (d)-(iii)	

- 174.** A Hominid fossil discovered in Java in 1891, now extinct, having cranial capacity of about 900 cc was:

- (1) *Homo erectus*
- (2) Neanderthal man
- (3) *Homo sapiens*
- (4) *Australopithecus*

- 175.** Match the following events that occur in their respective phases of cell cycle and select the correct option :

(a) G ₁ phase	(i) Cell grows and organelle duplication
(b) S phase	(ii) DNA replication and chromosome duplication
(c) G ₂ phase	(iii) Cytoplasmic growth
(d) Metaphase in M-phase	(iv) Alignment of chromosomes
(1) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)	
(2) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)	
(3) (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)	
(4) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)	

- 176.** Match the following columns and select the correct option :

Column - I	Column - II
(a) Pneumotaxic Centre	(i) Alveoli
(b) O ₂ Dissociation curve	(ii) Pons region of brain
(c) Carbonic Anhydrase	(iii) Haemoglobin
(d) Primary site of exchange of gases	(iv) R.B.C.
(1) (a)-(i), (b)-(iii), (c)-(ii), (d)-(iv)	
(2) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)	
(3) (a)-(iii), (b)-(ii), (c)-(iv), (d)-(i)	
(4) (a)-(iv), (b)-(i), (c)-(iii), (d)-(ii)	

- 177.** Which is the basis of genetic mapping of human genome as well as DNA finger printing ?

- (1) Polymorphism in DNA sequence
- (2) Single nucleotide polymorphism
- (3) Polymorphism in hnRNA sequence
- (4) Polymorphism in RNA sequence

- 178.** Which of the following conditions cause erythroblastosis foetalis ?

- (1) Mother Rh^{+ve} and foetus Rh^{-ve}
- (2) Mother Rh^{-ve} and foetus Rh^{+ve}
- (3) Both mother and foetus Rh^{-ve}
- (4) Both mother and foetus Rh^{+ve}

- 179.** All vertebrates are chordates but all chordates are not vertebrates, why ?

- (1) Notochord is replaced by vertebral column in adult of some chordates.
- (2) Ventral hollow nerve cord remains throughout life in some chordates.
- (3) All chordates possess vertebral column.
- (4) All chordates possess notochord throughout their life.

- 180.** Match the following columns and select the correct option

Column - I	Column - II
(a) Gout	(i) Decreased levels of estrogen
(b) Osteoporosis	(ii) Low Ca ⁺⁺ ions in the blood
(c) Tetany	(iii) Accumulation of uric acid crystals
(d) Muscular dystrophy	(iv) Auto immune disorder
	(v) Genetic disorder
(1) (a)-(ii), (b)-(i), (c)-(iii), (d)-(iv)	
(2) (a)-(iii), (b)-(i), (c)-(ii), (d)-(v)	
(3) (a)-(iv), (b)-(v), (c)-(i), (d)-(ii)	
(4) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)	

ANSWER KEY

NEET(UG)-2020(COVID-19)

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	3	1	2	1	2	4	2	1	2	4	2	1	2	3	1
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	1	3	2	2	2	3	4	2	2	4	3	3	1	1	2
Que.	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Ans.	1	3	2	3	3	4	1	2	4	2	2	4	3	2	1
Que.	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ans.	2	1	1	1	4	4	3	1	1	1	2	3	1	1	4
Que.	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Ans.	1	2	2	1	2	1	2	2	1	1	3	1	4	3	1
Que.	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
Ans.	2	2	4	1	1	3	1	1	4	1	3	1	4	3	1
Que.	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105
Ans.	1	4	2	2	1	1	2	2	2	1	4	2	2	3	4
Que.	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
Ans.	4	4	4	2	2	1	1	1	2	1	2	2	2	4	4
Que.	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135
Ans.	2	1	3	3	3	2	2	3	3	3	1	4	3	3	4
Que.	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
Ans.	4	1	1	4	4	2	4	2	2	4	3	2	1	2	1
Que.	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165
Ans.	4	3	1	4	3	4	1	1	2	1	3	2	4	2	2
Que.	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
Ans.	1	4	2	4	1	1	4	3	1	4	2	1	2	1	2

HINT - SHEET

- Gamma rays have shortest wavelength among all options.
- $\omega_0 = \frac{360}{60} \text{ rps} = 12 \pi \text{ rad s}^{-1}$
 $\omega = \frac{1200}{60} \text{ rps} = 40 \pi \text{ rad s}^{-1}$
 By using $\omega = \omega_0 + \alpha t$ we have $\alpha = \frac{\omega - \omega_0}{t}$
 $\Rightarrow \alpha = \frac{28\pi}{14} = 2\pi \text{ rad s}^{-2}$
- ${}_Z X^A \xrightarrow{\gamma\text{-decay}} {}_Z X^A$
 Due to gamma emission, there is no change in mass number and atomic number.
- $1' = \left(\frac{1}{60}\right)^\circ = \frac{1}{60} \times \frac{\pi}{180} = 2.91 \times 10^{-4} \text{ radian}$
- $\phi = 5t^2 + 3t + 60$
 $|\varepsilon| = \left|\frac{d\phi}{dt}\right| = 10t + 3$
 At $t = 4 \text{ sec.}$
 $|\varepsilon| = 40 + 3 = 43 \text{ volt}$
- Electric field in equatorial plane
 $\vec{E} = -\frac{k\vec{p}}{r^3} \Rightarrow \vec{E} = -\frac{\vec{p}}{4\pi\epsilon_0 r^3}$
- Spherometer is used to measure radius of curvature of the curved surface.
- Impedance, $z = \sqrt{R^2 + X_L^2}$
 $X_L \uparrow, Z \uparrow, I \downarrow$
- Efficiency of carnot engine
 $\eta = 1 - \frac{T_2}{T_1}$
 $T_1 = \text{temperature of source}$
 $T_2 = \text{temperature of sink}$
- In forward bias $V_P > V_N$
- $I = \frac{2+4}{4+1+1} = \frac{6V}{6\Omega} = 1 \text{ A}$
- For central maximum, the phase difference between the two waves will be zero.
- For hydrogen atom
 $E = -\frac{13.6}{n^2} \text{ eV}$

14. Option (3) is a combination of SHM of same ω and same axis so its resultant is also a SHM which is periodic.

$$15. \lambda = \frac{12.27}{\sqrt{V}} \text{ \AA} = \frac{12.27}{\sqrt{144}} \times 10^{-10} \\ = 1.02 \times 10^{-10} \text{ m} = 102 \times 10^{-3} \text{ nm}$$

$$16. \lambda = \frac{1}{\sqrt{2} \pi d^2 n} \propto \frac{1}{d^2}$$

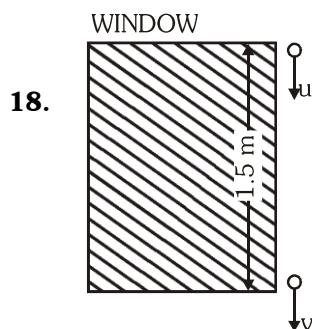
λ = mean free path

d = effective diameter of molecule

n = number density of molecules

17. Voltage drop across load resistance = 0.8 V

$$I_C = \frac{V_C}{R_C} = \frac{0.8}{800} = 10^{-3} \text{ A} = 1 \text{ mA}$$



$$\text{By using } s = ut + \frac{1}{2}at^2$$

$$1.5 = u(0.1) + \frac{1}{2}(10)(0.1)^2$$

$$\Rightarrow 15 = u + 0.5$$

$$\Rightarrow u = 14.5 \text{ ms}^{-1}$$

$$19. \lambda = \frac{2\pi}{K} = \frac{2\pi}{\pi \times 10^3} = 2 \times 10^{-3} \text{ m}$$

20. Frequency of stretched string

$$n = \frac{1}{2\ell} \sqrt{\frac{T}{m}}$$

Here T and m are constant so $n \propto \frac{1}{\ell}$

$$\text{Therefore } \frac{n'}{n} = \frac{\ell}{\ell'}$$

$$\Rightarrow \frac{180}{120} = \frac{90}{\ell}$$

$$\Rightarrow \ell' = 60 \text{ cm}$$

$$21. F = K \frac{e^2}{r^2} \Rightarrow a = K \frac{e^2}{mr^2}$$

$$\Rightarrow a = 9 \times 10^9 \frac{(1.6 \times 10^{-19})^2}{(1.6 \times 10^{-10})^2 (9 \times 10^{-31})}$$

$$\Rightarrow a = 10^{-29} \times 10^{51} = 10^{22} \text{ m/s}^2$$

22. The wave nature of electrons was experimentally verified by Davisson and Germer.

$$23. \text{Resistance of conductor, } R = \frac{\rho \ell}{A} \Rightarrow A = \frac{\rho \ell}{R}$$

$$\Rightarrow \frac{A_1}{A_2} = \frac{\rho_1}{\rho_2} \times \frac{\ell_1}{\ell_2} \times \left(\frac{R_2}{R_1} \right) = 1$$

$[\because R_1 = R_2, \ell_1 = \ell_2 \text{ and for same material}]$

$$\rho_1 = \rho_2]$$

24. By KVL

$$-I_2 R_2 - E_2 + E_3 + I_3 R_1 = 0$$

$$\Rightarrow I_2 R_2 + E_2 - E_3 - I_3 R_1 = 0$$

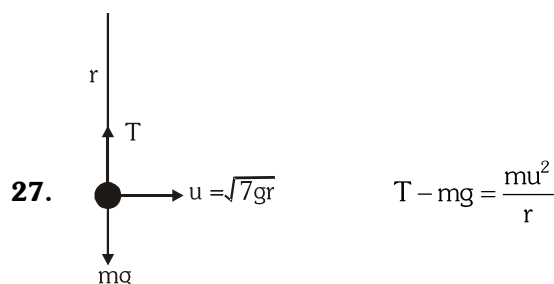
25. By using Wien's law $\lambda_m T = \text{constant}$,

$$\text{we have } T \propto \frac{1}{\lambda_m}$$

$$\text{As } \lambda_B < \lambda_Y < \lambda_R \quad (\text{VIBGYOR})$$

$$\Rightarrow T_A > T_C > T_B$$

26. When angle of contact $\geq 90^\circ$ then liquid doesn't wet solid.



$$T - mg = \frac{m(\sqrt{7gr})^2}{r} \Rightarrow T = 8 \text{ mg}$$

28. By using mirror formula $\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$

$$\text{We have } \frac{1}{-1.5f} + \frac{1}{v} = \frac{1}{-f} \Rightarrow \frac{1}{v} = -\frac{1}{f} + \frac{1}{1.5f}$$

$$\Rightarrow \frac{1}{v} = \frac{-1.5 + 1}{1.5f} = \frac{-0.5}{1.5f} \Rightarrow v = -3f$$

29. $R = \lambda N = \frac{0.693}{T} \times N$

$$\Rightarrow R = \frac{0.693}{1.4 \times 10^{17}} \times 2 \times 10^{21} = 10^4$$

30. $\sin \theta_c = \frac{1}{\mu}$

$$\mu = \frac{1}{\sin \theta_c} = \frac{1}{\sin 45^\circ} = \frac{1}{(1/\sqrt{2})} = \sqrt{2}$$

$$\mu = \frac{c}{v} \Rightarrow v = \frac{c}{\mu} = \frac{3 \times 10^8}{\sqrt{2}} \text{ m/s}$$

31. $\varepsilon = \frac{1}{2} B \omega r^2$

$$\varepsilon = \frac{1}{2} \times (0.4 \times 10^{-4}) \times \left(2\pi \left[\frac{120}{60} \right] \right) (1)^2$$

$$\varepsilon = 0.8\pi \times 10^{-4} = 2.512 \times 10^{-4} \text{ V}$$

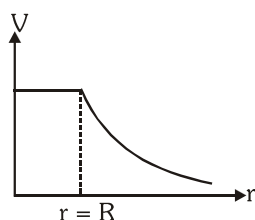
32. $PV = nRT$

$$\Rightarrow P = \frac{1}{V} \cdot \left(\frac{m}{M_0} \right) RT = \left(\frac{m}{V} \right) \left(\frac{RT}{M_0} \right)$$

$$\Rightarrow P = \frac{\rho RT}{M_0}$$

$$\rho = \frac{m}{V} = \text{mass density} \quad \& \quad M_0 = \text{molar mass}$$

33. $V_{in} = V_s = \frac{KQ}{R}$ and $V_{out} = \frac{KQ}{r} (r > R)$



34. NAND gate and NOR gate are universal logic gates.

35. $P = \text{constant} \Rightarrow$ Isobaric process

36. $P = \frac{100}{f} \Rightarrow f = \frac{100}{p} = \frac{100}{10} = 10 \text{ cm}$

$$f = \frac{R}{2(\mu - 1)} \text{ (for equiconvex lens)}$$

$$\Rightarrow 10 = \frac{10}{2(\mu - 1)}$$

$$\Rightarrow (\mu - 1) = \frac{1}{2} \Rightarrow \mu = \frac{1}{2} + 1 = \frac{3}{2}$$

37. For N type semi-conductor intrinsic semiconductor doped by pentavalent impurity.

38. $76 \text{ cm} \times \rho_{Hg} \times g = h \times \rho_L \times g$

$$h = 76 \text{ cm} \times \frac{\rho_{Hg}}{\rho_L} = 76 \text{ cm} \times \frac{13600}{760} = 13.6 \text{ m}$$

39. $M = I (\pi r^2)$ Where, $r = \frac{L}{2\pi}$

$$\Rightarrow M = I (\pi) \left(\frac{L}{2\pi} \right)^2 = \frac{IL^2}{4\pi}$$

40. $C_O = \frac{\epsilon_0 A}{d}$

$$C_K = \frac{\epsilon_0 A}{d - t + \frac{t}{k}} = \frac{\epsilon_0 A}{d - \frac{d}{2} + \frac{d}{8}}$$

$$= \frac{8 \epsilon_0 A}{5 d} = \frac{8}{5} C_O$$

41. At depth : $g_{\text{eff}} = g \left(1 - \frac{d}{R} \right)$

$$\Rightarrow \frac{g}{n} = g \left(1 - \frac{d}{R} \right)$$

$$\Rightarrow d = (n - 1) R/n$$

42. Mean of observation

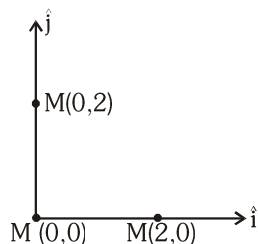
$$= \frac{1.25 + 1.24 + 1.27 + 1.21 + 1.28}{5} = 1.25 \text{ s}$$

Mean absolute error

$$= \frac{0 + 0.01 + 0.02 + 0.04 + 0.03}{5} = 0.02 \text{ s}$$

$$\% \text{ error} = \frac{0.02}{1.25} \times 100 = 1.6\%$$

43.

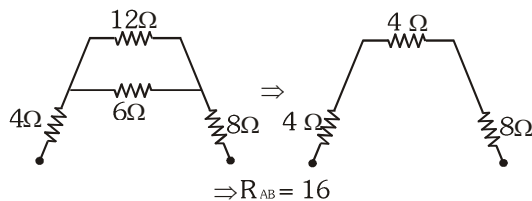


$$X_{CM} = \frac{M \times 0 + M \times 2 + M \times 0}{3M} = \frac{2}{3}$$

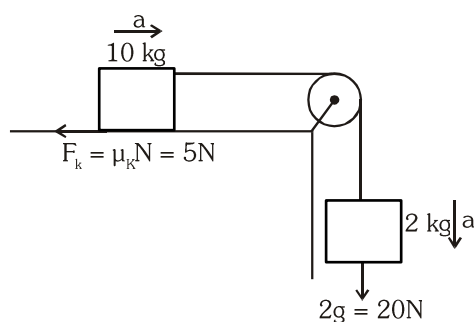
$$Y_{CM} = \frac{M \times 0 + M \times 2 + M \times 0}{3M} = \frac{2}{3}$$

$$\text{Position vector } \vec{r} = X_{CM}\hat{i} + Y_{CM}\hat{j} = \frac{2}{3}\hat{i} + \frac{2}{3}\hat{j}$$

44.



45.

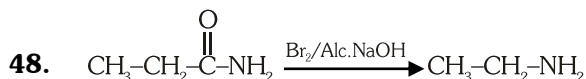


$$a = \frac{\text{net force}}{\text{total mass}} = \frac{20 - 5}{12} = 1.25 \text{ m/s}^2$$

46. Acid rain causes damage to monuments like Tajmahal.

47. Ox. state of "O" in Cu_2O = -2Ox. state of "Cl" in ClO_3^- = +5Ox. state of "Cr" in $\text{K}_2\text{Cr}_2\text{O}_7$ = +6Ox. state of "Au" in HAuCl_4 = +3

∴ (1) is incorrect

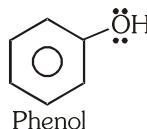


Hoffmann bromamide degradation reaction.

49. Compounds purified by steam distillation which are immiscible in water but steam volatile.

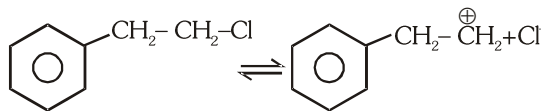
50. $\text{:N}\equiv\text{N}\rightarrow \ddot{\text{O}}\text{:}$ (Linear)

51.



+ R effect of -OH group enhances the reactivity in aromatic electrophilic substitution reaction.

52.

Reactivity in case of $\text{S}_{\text{N}}1$ reaction depends upon formation of carbocation.

Primary carbocation is less likely to be formed (due to unstability)

53.

Chloramphenicol is a broad spectrum antibiotic which can inhibit the growth of gram positive bacteria and gram negative bacteria.

54.

Bakelite is an example of cross-linked polymer.

55.

$$\Delta G = \Delta H - T\Delta S$$

For spontaneous,

$$\Delta G < 0$$

$$\Delta H - T\Delta S < 0$$

$$\Delta S > \frac{\Delta H}{T}$$

$$\Delta S > \frac{30 \times 10^3 \text{ J mol}^{-1}}{450 \text{ K}}$$

$$\Delta S > 66.6 \text{ J mol}^{-1} \text{ K}^{-1} \text{ (Check by options)}$$

56.

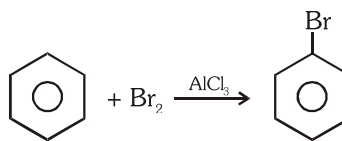
Copper – Transition metal

Fluorine – Non metal

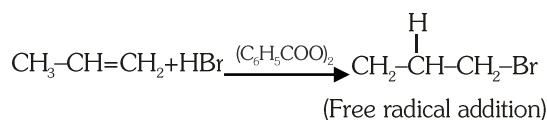
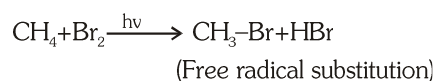
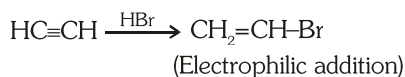
Silicon – Metalloids

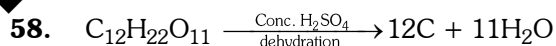
Cerium – Lanthanoid

57.

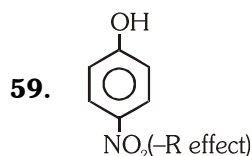


(Aromatic electrophilic substitution)



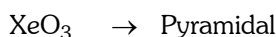
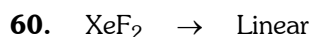


Black



-NO₂ group is electron withdrawing group.

Which increases the acidic strength of phenol.



61. $(t_{1/2})_{\text{zero}} = \frac{[A]_0}{2K}$

$100s = \frac{0.02M}{2K}$

$K = \frac{0.02M}{2 \times 100} = 1 \times 10^{-4} \text{ mol L}^{-1} \text{ s}^{-1}$

62. Lanthanoids shows general oxidation state +3 but some elements can shows +2 as well as +4.

63. In the given options

The metal which reveals a maximum number of oxidation state \rightarrow Mn

The metal although placed in 3d block is considered not as a transition element is \rightarrow Zn

The metal which does not exhibit variable oxidation state is \rightarrow Sc (only +3)

The metal which in +1 oxidation state in aqueous solution undergoes disproportionation is \rightarrow Cu

64. Assuming dilute solution,

$$\frac{P_0 - P_s}{P_s} \approx \frac{P_0 - P_s}{P_0} = \frac{n_{\text{solute}}}{n_{\text{solvent}}}$$

Let $P_0 = 100$, V.P reduced to 80%, $\therefore P_s = 80$

$$\frac{100 - 80}{100} = \frac{8/m}{114/114}$$

$$m = 40$$

65. sp^3 - tetrahedral, dsp^2 - square planar

sp^3d - trigonal bipyramidal, d^2sp^3 - octahedral

66. No. of angular nodes = ℓ

No. of Radial nodes = $n - \ell - 1$

For 3s; $n = 3$ and $\ell = 0$

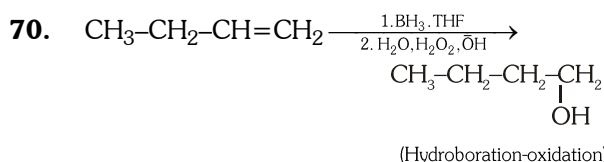
\therefore No. of angular nodes = 0

\therefore No. of radial nodes = 2

67. Li & Mg shows diagonal relationship that's why they shows similarity in their physical properties.

68. Deficiency of vitamin D causes osteomalacia (soft bones and joint pain in adults)

69. PCl_5 - Trigonal bipyramidal



71. According to electrode potential series,
 $Au^{+3} + 3e^- \rightarrow Au(s)$

(has topmost position \Rightarrow max. SRP)

72. B - Purified by Zone Refining

Sn - Liquation

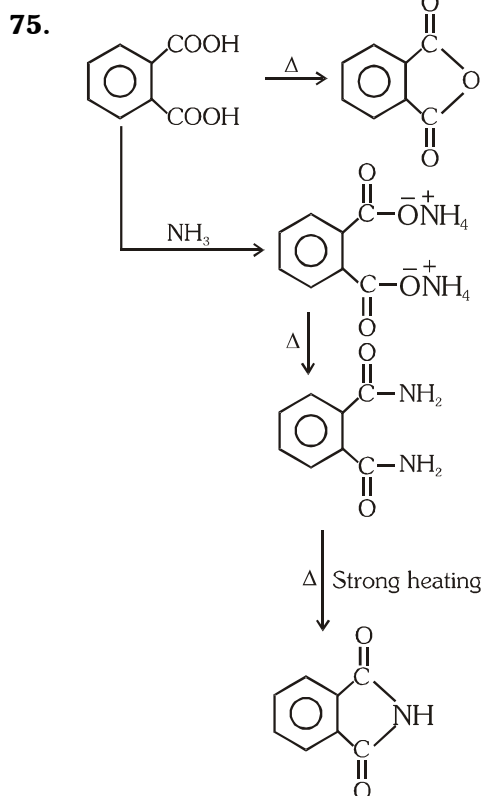
Zr - Van arkel method

Ni - Mond's process

73. $CH_3COONa \Rightarrow$ Salt of CH_3COOH (WA)+ $NaOH$ (SB)

\therefore Solution of CH_3COONa shows basic nature.

74. Starch is example of negative sol.



76. In typical fuel cell

Reactants = H_2, O_2

Products = H_2O

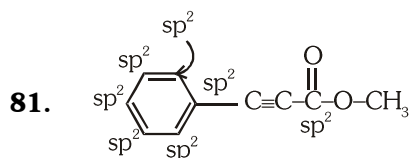
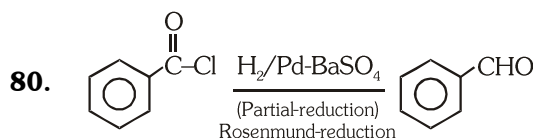
77. Z_{AB} = Collision frequency

78. $\begin{array}{c} \text{CHO} \\ | \\ (\text{CHOH})_4 \\ | \\ \text{CH}_2\text{OH} \end{array}$ It is an aldohexose sugar.

Glucose

79. As per the given curve bond energy is the amount of energy is released during the bond formation is i.e. = Final - Initial

$$= b - a$$



7- sp^2 carbons, 6π bonds

82. $\Delta H = \Sigma(\text{B.E})_{\text{Reactants}} - \Sigma(\text{B.E})_{\text{Products}}$

$$-109 = [\text{B.E}_{(\text{H-H})} + \text{B.E}_{(\text{Br-Br})}] - [2 \times \text{B.E}_{(\text{H-Br})}]$$

$$-109 = 435 + 192 - 2 \times \text{B.E}_{(\text{H-Br})}$$

$$\text{B.E}_{(\text{H-Br})} = \frac{435 + 192 + 109}{2} = 368 \text{ KJ/mol}$$

83. By Boyle's law

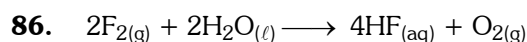
$$P_1V_1 = P_2V_2$$

$$1 \text{ bar} \times 600 \text{ dm}^3 = P_2 \times 150 \text{ dm}^3$$

$$P_2 = 4 \text{ bar}$$

84. The purpose of adding gypsum is only to slow down the process of setting of cement so that it gets sufficiently hardened

85. SnO_2 - amphoteric



It's a type of Redox reaction.

87. AgBr shows both schottky and frenkel defect

88. Number of C-atom = $\frac{12}{1.9926 \times 10^{-23}}$
 $= 6.022 \times 10^{23}$

89. Isotonic solutions have same osmotic pressure.

90. K_{sp} for AB = $s^2 = 4 \times 10^{-8}$

$$\therefore \text{Molarity of solution} = \text{solubility} = \sqrt{K_{\text{sp}}}$$

$$= \sqrt{4 \times 10^{-8}}$$

$$= 2 \times 10^{-4} \text{ mol/L}$$

NEET(UG) – 2020

1. The color code of a resistance is given below



The values of resistance and tolerance, respectively, are :

- (1) 470Ω , 5% (2) $470 \text{ k}\Omega$, 5%
(3) $47 \text{ k}\Omega$, 10% (4) $4.7 \text{ k}\Omega$, 5%
2. Find the torque about the origin when a force of $3\hat{j} \text{ N}$ acts on a particle whose position vector is $2\hat{k} \text{ m}$:
- (1) $6\hat{k} \text{ Nm}$ (2) $6\hat{i} \text{ Nm}$
(3) $6\hat{j} \text{ Nm}$ (4) $-6\hat{i} \text{ Nm}$
3. A cylinder contains hydrogen gas at pressure of 249 kPa and temperature 27°C .
Its density is : ($R = 8.3 \text{ J mol}^{-1} \text{ K}^{-1}$)
- (1) 0.02 kg/m^3 (2) 0.5 kg/m^3
(3) 0.2 kg/m^3 (4) 0.1 kg/m^3
4. Two cylinders A and B of equal capacity are connected to each other via a stop cock. A contains an ideal gas at standard temperature and pressure. B is completely evacuated. The entire system is thermally insulated. The stop cock is suddenly opened. The process is :
- (1) isobaric
(2) isothermal
(3) adiabatic
(4) isochoric
5. Two particles of mass 5 kg and 10 kg respectively are attached to the two ends of a rigid rod of length 1 m with negligible mass.
The centre of mass of the system from the 5 kg particle is nearly at a distance of :
- (1) 80 cm (2) 33 cm
(3) 50 cm (4) 67 cm

6. A ray is incident at an angle of incidence i on one surface of a small angle prism (with angle of prism A) and emerges normally from the opposite surface. If the refractive index of the material of the prism is μ , then the angle of incidence is nearly equal to:

(1) $\frac{\mu A}{2}$ (2) $\frac{A}{2\mu}$
(3) $\frac{2A}{\mu}$ (4) μA

7. A body weighs 72 N on the surface of the earth. What is the gravitational force on it, at a height equal to half the radius of the earth?

(1) 24 N (2) 48 N
(3) 32 N (4) 30 N

8. An iron rod of susceptibility 599 is subjected to a magnetising field of 1200 A m^{-1} . The permeability of the material of the rod is :

($\mu_0 = 4\pi \times 10^{-7} \text{ T m A}^{-1}$)

(1) $2.4\pi \times 10^{-7} \text{ T m A}^{-1}$
(2) $2.4\pi \times 10^{-4} \text{ T m A}^{-1}$
(3) $8.0 \times 10^{-5} \text{ T m A}^{-1}$
(4) $2.4\pi \times 10^{-5} \text{ T m A}^{-1}$

9. For transistor action, which of the following statements is **correct**?

- (1) The base region must be very thin and lightly doped.
(2) Base, emitter and collector regions should have same doping concentrations.
(3) Base, emitter and collector regions should have same size.
(4) Both emitter junction as well as the collector junction are forward biased.

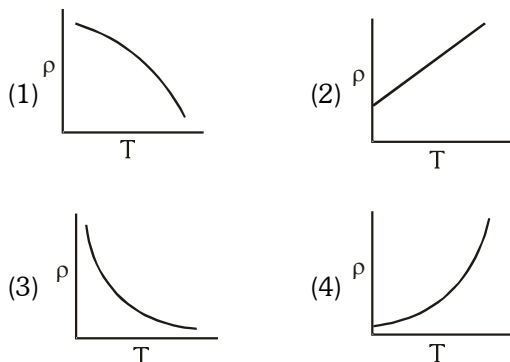
10. Light with an average flux of 20 W/cm^2 falls on a non-reflecting surface at normal incidence having surface area 20 cm^2 . The energy received by the surface during time span of 1 minute is :

(1) $48 \times 10^3 \text{ J}$ (2) $10 \times 10^3 \text{ J}$
(3) $12 \times 10^3 \text{ J}$ (4) $24 \times 10^3 \text{ J}$

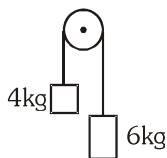
- 11.** A short electric dipole has a dipole moment of $16 \times 10^{-9} \text{ C m}$. The electric potential due to the dipole at a point at a distance of 0.6 m from the centre of the dipole, situated on a line making an angle of 60° with the dipole axis is :
- $$\left(\frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ Nm}^2 / \text{C}^2 \right)$$
- (1) zero (2) 50 V
(3) 200 V (4) 400 V
- 12.** A ball is thrown vertically downward with a velocity of 20 m/s from the top of a tower. It hits the ground after some time with a velocity of 80 m/s. The height of the tower is :
- ($g = 10 \text{ m/s}^2$)
- (1) 300 m (2) 360 m
(3) 340 m (4) 320 m
- 13.** A resistance wire connected in the left gap of a metre bridge balances a 10Ω resistance in the right gap at a point which divides the bridge wire in the ratio 3 : 2. If the length of the resistance wire is 1.5 m, then the length of 1Ω of the resistance wire is :
- (1) $1.5 \times 10^{-2} \text{ m}$ (2) $1.0 \times 10^{-2} \text{ m}$
(3) $1.0 \times 10^{-1} \text{ m}$ (4) $1.5 \times 10^{-1} \text{ m}$
- 14.** When a uranium isotope ${}^{235}_{92}\text{U}$ is bombarded with a neutron, it generates ${}^{89}_{36}\text{Kr}$, three neutrons and:
- (1) ${}^{103}_{36}\text{Kr}$ (2) ${}^{144}_{56}\text{Ba}$
(3) ${}^{91}_{40}\text{Zr}$ (4) ${}^{101}_{36}\text{Kr}$
- 15.** A long solenoid of 50 cm length having 100 turns carries a current of 2.5 A. The magnetic field at the centre of the solenoid is :
- ($\mu_0 = 4\pi \times 10^{-7} \text{ T m A}^{-1}$)
- (1) $3.14 \times 10^{-5} \text{ T}$ (2) $6.28 \times 10^{-4} \text{ T}$
(3) $3.14 \times 10^{-4} \text{ T}$ (4) $6.28 \times 10^{-5} \text{ T}$
- 16.** The average thermal energy for a mono-atomic gas is : (k_B is Boltzmann constant and T , absolute temperature)
- (1) $\frac{7}{2} k_B T$ (2) $\frac{1}{2} k_B T$
(3) $\frac{3}{2} k_B T$ (4) $\frac{5}{2} k_B T$
- 17.** A capillary tube of radius r is immersed in water and water rises in it to a height h . The mass of the water in the capillary is 5g. Another capillary tube of radius $2r$ is immersed in water. The mass of water that will rise in this tube is :
- (1) 20.0 g (2) 2.5 g
(3) 5.0 g (4) 10.0 g
- 18.** The ratio of contributions made by the electric field and magnetic field components to the intensity of an electromagnetic wave is : (c = speed of electromagnetic waves)
- (1) $1 : c^2$ (2) $c : 1$
(3) $1 : 1$ (4) $1 : c$
- 19.** Assume that light of wavelength 600 nm is coming from a star. The limit of resolution of telescope whose objective has a diameter of 2 m is :
- (1) $6.00 \times 10^{-7} \text{ rad}$ (2) $3.66 \times 10^{-7} \text{ rad}$
(3) $1.83 \times 10^{-7} \text{ rad}$ (4) $7.32 \times 10^{-7} \text{ rad}$
- 20.** A wire of length L , area of cross section A is hanging from a fixed support. The length of the wire changes to L_1 when mass M is suspended from its free end. The expression for Young's modulus is :
- (1) $\frac{MgL}{A(L_1 - L)}$ (2) $\frac{MgL_1}{AL}$
(3) $\frac{Mg(L_1 - L)}{AL}$ (4) $\frac{MgL}{AL_1}$
- 21.** The energy required to break one bond in DNA is 10^{-20} J . This value in eV is nearly :
- (1) 0.006 (2) 6
(3) 0.6 (4) 0.06
- 22.** In a certain region of space with volume 0.2 m^3 the electric potential is found to be 5 V throughout. The magnitude of electric field in this region is :
- (1) 5 N/C (2) Zero
(3) 0.5 N/C (4) 1 N/C
- 23.** The mean free path for a gas, with molecular diameter d and number density n can be expressed as :
- (1) $\frac{1}{\sqrt{2} n^2 \pi^2 d^2}$ (2) $\frac{1}{\sqrt{2} n \pi d}$
(3) $\frac{1}{\sqrt{2} n \pi d^2}$ (4) $\frac{1}{\sqrt{2} n^2 \pi d^2}$

24. An electron is accelerated from rest through a potential difference of V volt. If the de Broglie wavelength of the electron is 1.227×10^{-2} nm, the potential difference is:
- (1) 10^4 V (2) 10 V
(3) 10^2 V (4) 10^3 V
25. In a guitar, two strings A and B made of same material are slightly out of tune and produce beats of frequency 6 Hz. When tension in B is slightly decreased, the beat frequency increases to 7 Hz. If the frequency of A is 530 Hz, the original frequency of B will be:
- (1) 537 Hz (2) 523 Hz
(3) 524 Hz (4) 536 Hz
26. A $40 \mu\text{F}$ capacitor is connected to a 200 V, 50 Hz ac supply. The rms value of the current in the circuit is, nearly :
- (1) 25.1 A (2) 1.7 A
(3) 2.05 A (4) 2.5 A
27. The increase in the width of depletion region in a p-n junction diode is due to :
- (1) increase in forward current
(2) forward bias only
(3) reverse bias only
(4) both forward bias and reverse bias
28. The Brewsters angle i_b for an interface should be:
- (1) $i_b = 90^\circ$ (2) $0^\circ < i_b < 30^\circ$
(3) $30^\circ < i_b < 45^\circ$ (4) $45^\circ < i_b < 90^\circ$
29. The phase difference between displacement and acceleration of a particle in a simple harmonic motion is :
- (1) Zero (2) π rad
(3) $\frac{3\pi}{2}$ rad (4) $\frac{\pi}{2}$ rad
30. A spherical conductor of radius 10 cm has a charge of 3.2×10^{-7} C distributed uniformly. What is the magnitude of electric field at a point 15 cm from the centre of the sphere ?
- $$\left(\frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ Nm}^2/\text{C}^2 \right)$$
- (1) 1.28×10^7 N/C
(2) 1.28×10^4 N/C
(3) 1.28×10^5 N/C
(4) 1.28×10^6 N/C
31. The capacitance of a parallel plate capacitor with air as medium is $6 \mu\text{F}$. With the introduction of a dielectric medium, the capacitance becomes $30 \mu\text{F}$. The permittivity of the medium is :
- ($\epsilon_0 = 8.85 \times 10^{-12} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$)
- (1) $5.00 \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$
(2) $0.44 \times 10^{-13} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$
(3) $1.77 \times 10^{-12} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$
(4) $0.44 \times 10^{-10} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$
32. Taking into account of the significant figures, what is the value of $9.99 \text{ m} - 0.0099 \text{ m}$?
- (1) 9.9 m (2) 9.9801 m
(3) 9.98 m (4) 9.980 m
33. A series LCR circuit is connected to an ac voltage source. When L is removed from the circuit, the phase difference between current and voltage is $\frac{\pi}{3}$. If instead C is removed from the circuit, the phase difference is again $\frac{\pi}{3}$ between current and voltage. The power factor of the circuit is :
- (1) -1.0 (2) zero
(3) 0.5 (4) 1.0
34. Dimensions of stress are :
- (1) $[M L^{-1} T^{-2}]$ (2) $[M L T^{-2}]$
(3) $[M L^2 T^{-2}]$ (4) $[M L^0 T^{-2}]$
35. Light of frequency 1.5 times the threshold frequency is incident on a photosensitive material. What will be the photoelectric current if the frequency is halved and intensity is doubled ?
- (1) zero (2) doubled
(3) four times (4) one-fourth
36. The solids which have the negative temperature coefficient of resistance are :
- (1) insulators and semiconductors
(2) metals
(3) insulators only
(4) semiconductors only
37. A charged particle having drift velocity of $7.5 \times 10^{-4} \text{ ms}^{-1}$ is in an electric field of $3 \times 10^{-10} \text{ Vm}^{-1}$, has a mobility in $\text{m}^2 \text{ V}^{-1} \text{ s}^{-1}$ of :
- (1) 2.25×10^{-15} (2) 2.25×10^{15}
(3) 2.5×10^6 (4) 2.5×10^{-6}

38. Which of the following graph represents the variation of resistivity (ρ) with temperature (T) for copper ?

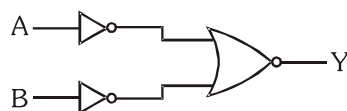


39. Two bodies of mass 4kg and 6kg are tied to the ends of a massless string. The string passes over a pulley which is frictionless (see figure). The acceleration of the system in terms of acceleration due to gravity (g) is:



- (1) $g/10$ (2) g
(3) $g/2$ (4) $g/5$
40. A screw gauge has least count of 0.01 mm and there are 50 divisions in its circular scale. The pitch of the screw gauge is :
- (1) 1.0 mm (2) 0.01 mm
(3) 0.25 mm (4) 0.5 mm
41. In Young's double slit experiment, if the separation between coherent sources is halved and the distance of the screen from the coherent sources is doubled, then the fringe width becomes :
- (1) one-fourth (2) double
(3) half (4) four times

42. For the logic circuit shown, the truth table is :



(1)	A	B	Y
	0	0	1
	0	1	0
	1	0	0
	1	1	0
(2)	A	B	Y
	0	0	0
	0	1	0
	1	0	0
	1	1	1
(3)	A	B	Y
	0	0	0
	0	1	1
	1	0	1
	1	1	1
(4)	A	B	Y
	0	0	1
	0	1	1
	1	0	1
	1	1	0

43. The energy equivalent of 0.5 g of a substance is:

(1) 0.5×10^{13} J	(2) 4.5×10^{16} J
(3) 4.5×10^{13} J	(4) 1.5×10^{13} J

44. For which one of the following, Bohr model is **not** valid ?

- (1) Singly ionised neon atom (Ne^+)
(2) Hydrogen atom
(3) Singly ionised helium atom (He^+)
(4) Deuteron atom

45. The quantities of heat required to raise the temperature of two solid copper spheres of radii r_1 and r_2 ($r_1 = 1.5 r_2$) through 1 K are in the ratio:

(1) $\frac{5}{3}$	(2) $\frac{27}{8}$
(3) $\frac{9}{4}$	(4) $\frac{3}{2}$

- 46.** Match the following and identify the correct option.
- | | |
|---|---|
| (a) $\text{CO(g)} + \text{H}_2\text{(g)}$ | (i) $\text{Mg(HCO}_3)_2 + \text{Ca(HCO}_3)_2$ |
| (b) Temporary hardness of water | (ii) An electron deficient hydride |
| (c) B_2H_6 | (iii) Synthesis gas |
| (d) H_2O_2 | (iv) Non-planar structure |
- | (a) | (b) | (c) | (d) |
|-----------|-------|------|------|
| (1) (i) | (iii) | (ii) | (iv) |
| (2) (iii) | (i) | (ii) | (iv) |
| (3) (iii) | (ii) | (i) | (iv) |
| (4) (iii) | (iv) | (ii) | (i) |
- 47.** A tertiary butyl carbocation is more stable than a secondary butyl carbocation because of which of the following ?
- (1) Hyperconjugation
 - (2) -I effect of $-\text{CH}_3$ groups
 - (3) +R effect of $-\text{CH}_3$ groups
 - (4) -R effect of $-\text{CH}_3$ groups
- 48.** What is the change in oxidation number of carbon in the following reaction ?
- $$\text{CH}_4\text{(g)} + 4\text{Cl}_2\text{(g)} \rightarrow \text{CCl}_4\text{(l)} + 4\text{HCl(g)}$$
- (1) 0 to -4
 - (2) +4 to +4
 - (3) 0 to +4
 - (4) -4 to +4
- 49.** Sucrose on hydrolysis gives :
- (1) α -D-Fructose + β -D-Fructose
 - (2) β -D-Glucose + α -D-Fructose
 - (3) α -D-Glucose + β -D-Glucose
 - (4) α -D-Glucose + β -D-Fructose
- 50.** The calculated spin only magnetic moment of Cr^{2+} ion is :
- (1) 2.84 BM
 - (2) 3.87 BM
 - (3) 4.90 BM
 - (4) 5.92 BM
- 51.** Identify a molecule which does not exist.
- (1) O_2
 - (2) He_2
 - (3) Li_2
 - (4) C_2
- 52.** Which of the following oxoacid of sulphur has -O-O- linkage ?
- (1) $\text{H}_2\text{S}_2\text{O}_7$, pyrosulphuric acid
 - (2) H_2SO_3 , sulphurous acid
 - (3) H_2SO_4 , sulphuric acid
 - (4) $\text{H}_2\text{S}_2\text{O}_8$, peroxodisulphuric acid
- 53.** Which of the following is the correct order of increasing field strength of ligands to form coordination compounds ?
- (1) $\text{CN}^- < \text{C}_2\text{O}_4^{2-} < \text{SCN}^- < \text{F}^-$
 - (2) $\text{SCN}^- < \text{F}^- < \text{C}_2\text{O}_4^{2-} < \text{CN}^-$
 - (3) $\text{SCN}^- < \text{F}^- < \text{CN}^- < \text{C}_2\text{O}_4^{2-}$
 - (4) $\text{F}^- < \text{SCN}^- < \text{C}_2\text{O}_4^{2-} < \text{CN}^-$
- 54.** The number of Faradays(F) required to produce 20 g of calcium from molten CaCl_2 (Atomic mass of Ca = 40 g mol⁻¹) is :
- (1) 4
 - (2) 1
 - (3) 2
 - (4) 3
- 55.** Reaction between acetone and methylmagnesium chloride followed by hydrolysis will give :
- (1) Isobutyl alcohol
 - (2) Isopropyl alcohol
 - (3) Sec. butyl alcohol
 - (4) Tert. butyl alcohol
- 56.** Which of the following is a cationic detergent ?
- (1) Sodium dodecylbenzene sulphonate
 - (2) Sodium lauryl sulphate
 - (3) Sodium stearate
 - (4) Cetyltrimethyl ammonium bromide
- 57.** Identify the incorrect statement.
- (1) The oxidation states of chromium in CrO_4^{2-} and $\text{Cr}_2\text{O}_7^{2-}$ are not the same
 - (2) Cr^{2+} (d^4) is a stronger reducing agent than Fe^{2+} (d^6) in water.
 - (3) The transition metals and their compounds are known for their catalytic activity due to their ability to adopt multiple oxidation states and to form complexes.
 - (4) Interstitial compounds are those that are formed when small atoms like H, C or N are trapped inside the crystal lattices of metals.
- 58.** Which of the following alkane cannot be made in good yield by Wurtz reaction ?
- (1) n-Butane
 - (2) n-Hexane
 - (3) 2,3-Dimethylbutane
 - (4) n-Heptane

59. Urea reacts with water to form A which will decompose to form B. B when passed through Cu^{2+} (aq), deep blue colour solution C is formed. What is the formula of C from the following ?

- (1) $\text{CuCO}_3 \cdot \text{Cu(OH)}_2$ (2) CuSO_4
(3) $[\text{Cu(NH}_3)_4]^{2+}$ (4) Cu(OH)_2

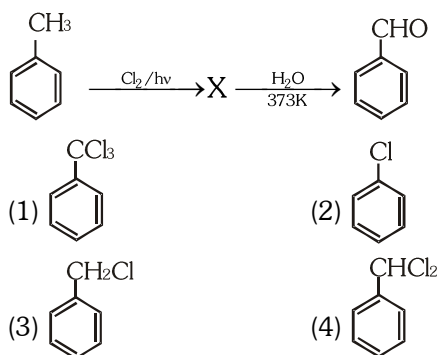
60. The freezing point depression constant (K_f) of benzene is $5.12 \text{ K kg mol}^{-1}$. The freezing point depression for the solution of molality 0.078 m containing a non-electrolyte solute in benzene is (rounded off upto two decimal places) :

- (1) 0.60 K (2) 0.20 K
(3) 0.80 K (4) 0.40 K

61. The number of protons, neutrons and electrons in $^{175}_{71}\text{Lu}$, respectively, are :

- (1) 175, 104 and 71 (2) 71, 104 and 71
(3) 104, 71 and 71 (4) 71, 71 and 104

62. Identify compound X in the following sequence of reactions :



63. Identify the **correct** statement from the following:

- (1) Pig iron can be moulded into a variety of shapes.
(2) Wrought iron is impure iron with 4% carbon.
(3) Blister copper has blistered appearance due to evolution of CO_2 .
(4) Vapour phase refining is carried out for Nickel by Van Arkel method.

64. Which of the following set of molecules will have zero dipole moment ?

- (1) Boron trifluoride, beryllium difluoride, carbon dioxide, 1,4-dichlorobenzene
(2) Ammonia, beryllium difluoride, water, 1,4-dichlorobenzene
(3) Boron trifluoride, hydrogen fluoride, carbon dioxide, 1,3-dichlorobenzene
(4) Nitrogen trifluoride, beryllium difluoride, water, 1,3-dichlorobenzene

65. Paper chromatography is an example of:

- (1) Column chromatography
(2) Adsorption chromatography
(3) Partition chromatography
(4) Thin layer chromatography

66. Identify the **incorrect** match :

Name	IUPAC Official Name
(a) Unnilunium	(i) Mendeleevium
(b) Unniltrium	(ii) Lawrencium
(c) Unnilhexium	(iii) Seaborgium
(d) Unununnium	(iv) Darmstadtium
(1) (d), (iv)	(2) (a), (i)
(3) (b), (ii)	(4) (c), (iii)

67. Find out the solubility of Ni(OH)_2 in 0.1M NaOH. Given that the ionic product of Ni(OH)_2 is 2×10^{-15} .

- (1) $1 \times 10^8 \text{ M}$
(2) $2 \times 10^{-13} \text{ M}$
(3) $2 \times 10^{-8} \text{ M}$
(4) $1 \times 10^{-13} \text{ M}$

68. Which of the following is a natural polymer?

- (1) poly (Butadiene-acrylonitrile)
(2) cis-1,4-polyisoprene
(3) poly (Butadiene-styrene)
(4) polybutadiene

69. Reaction between benzaldehyde and acetophenone in presence of dilute NaOH is known as :

- (1) Cross Aldol condensation
(2) Aldol condensation
(3) Cannizzaro's reaction
(4) Cross Cannizzaro's reaction

70. The mixture which shows positive deviation from Raoult's law is :-

- (1) Chloroethane + Bromoethane
(2) Ethanol + Acetone
(3) Benzene + Toluene
(4) Acetone + Chloroform

71. The rate constant for a first order reaction is $4.606 \times 10^{-3} \text{ s}^{-1}$. The time required to reduce 2.0 g of the reactant to 0.2 g is :

(1) 1000 s (2) 100 s
(3) 200 s (4) 500 s

72. HCl was passed through a solution of CaCl_2 , MgCl_2 and NaCl. Which of the following compound(s) crystallise(s) ?

(1) NaCl, MgCl_2 and CaCl_2
(2) Both MgCl_2 and CaCl_2
(3) Only NaCl
(4) Only MgCl_2

73. The correct option for free expansion of an ideal gas under adiabatic condition is :

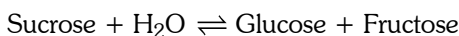
(1) $q > 0$, $\Delta T > 0$ and $w > 0$
(2) $q = 0$, $\Delta T = 0$ and $w = 0$
(3) $q = 0$, $\Delta T < 0$ and $w > 0$
(4) $q < 0$, $\Delta T = 0$ and $w = 0$

74. Identify the **correct** statements from the following:

(a) $\text{CO}_2(\text{g})$ is used as refrigerant for ice-cream and frozen food.
(b) The structure of C_{60} contains twelve six carbon rings and twenty five carbon rings.
(c) ZSM-5, a type of zeolite, is used to convert alcohols into gasoline.
(d) CO is colorless and odourless gas.

(1) (c) and (d) only
(2) (a) and (b) and (c) only
(3) (a) and (c) only
(4) (b) and (c) only

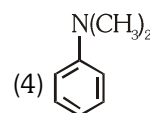
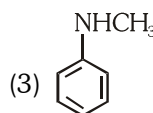
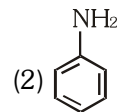
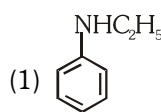
75. Hydrolysis of sucrose is given by the following reaction.



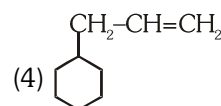
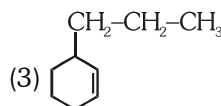
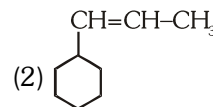
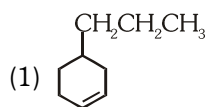
If the equilibrium constant (K_c) is 2×10^{13} at 300K, the value of $\Delta_r G^\circ$ at the same temperature will be:

(1) $-8.314 \text{ J mol}^{-1} \text{ K}^{-1} \times 300 \text{ K} \times \ln(4 \times 10^{13})$
(2) $-8.314 \text{ J mol}^{-1} \text{ K}^{-1} \times 300 \text{ K} \times \ln(2 \times 10^{13})$
(3) $8.314 \text{ J mol}^{-1} \text{ K}^{-1} \times 300 \text{ K} \times \ln(2 \times 10^{13})$
(4) $8.314 \text{ J mol}^{-1} \text{ K}^{-1} \times 300 \text{ K} \times \ln(3 \times 10^{13})$

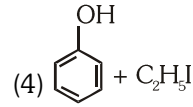
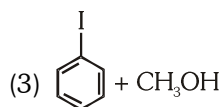
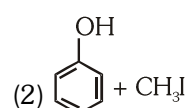
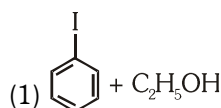
76. Which of the following amine will give the carbylamine test?



77. An alkene on ozonolysis gives methanal as one of the product. Its structure is :



78. Anisole on cleavage with HI gives:



79. Elimination reaction of 2-Bromo-pentane to form pent-2-ene is:

(a) β -Elimination reaction
(b) Follow Zaitsev rule
(c) Dehydrohalogenation reaction
(d) Dehydration reaction

(1) (a), (b), (d) (2) (a), (b), (c)
(3) (a), (c), (d) (4) (b), (c), (d)

80. An increase in the concentration of the reactants of a reaction leads to change in :

(1) collision frequency
(2) activation energy
(3) heat of reaction
(4) threshold energy

- 81.** Which of the following is a basic amino acid:
- Lysine
 - Serine
 - Alanine
 - Tyrosine
- 82.** The following metal ion activates many enzymes, participates in the oxidation of glucose to produce ATP and with Na, is responsible for the transmission of nerve signals.
- Potassium
 - Iron
 - Copper
 - Calcium
- 83.** For the reaction $2\text{Cl(g)} \rightarrow \text{Cl}_2\text{(g)}$, the **correct** option is:
- $\Delta_r H < 0$ and $\Delta_r S < 0$
 - $\Delta_r H > 0$ and $\Delta_r S > 0$
 - $\Delta_r H > 0$ and $\Delta_r S < 0$
 - $\Delta_r H < 0$ and $\Delta_r S > 0$
- 84.** Match the following :
- | Oxide | Nature |
|-----------------------------|-----------------|
| (a) CO | (i) Basic |
| (b) BaO | (ii) Neutral |
| (c) Al_2O_3 | (iii) Acidic |
| (d) Cl_2O_7 | (iv) Amphoteric |
- Which of the following is **correct** option?
- | (a) | (b) | (c) | (d) |
|-----------|-------|-------|-------|
| (1) (iv) | (iii) | (ii) | (i) |
| (2) (i) | (ii) | (iii) | (iv) |
| (3) (ii) | (i) | (iv) | (iii) |
| (4) (iii) | (iv) | (i) | (ii) |
- 85.** Measuring Zeta potential is useful in determining which property of colloidal solution?
- Size of the colloidal particles
 - Viscosity
 - Solubility
 - Stability of the colloidal particles
- 86.** A mixture of N_2 and Ar gases in a cylinder contains 7g of N_2 and 8g of Ar. If the total pressure of the mixture of gases in the cylinder is 27 bar, the partial pressure of N_2 is:
- [Use atomic masses (in g mol^{-1}) : N = 14, Ar = 40]
- 18 bar
 - 9 bar
 - 12 bar
 - 15 bar
- 87.** Which of the following is **not** correct about carbon monoxide?
- It is produced due to incomplete combustion
 - It forms carboxyhaemoglobin
 - It reduce oxygen carrying ability of blood
 - The carboxyhaemoglobin (haemoglobin bound to CO) is less stable than oxyhaemoglobin.
- 88.** An element has a body centered cubic (bcc) structure with a cell edge of 288 pm. The atomic radius is :
- $\frac{4}{\sqrt{2}} \times 288 \text{ pm}$
 - $\frac{\sqrt{3}}{4} \times 288 \text{ pm}$
 - $\frac{\sqrt{2}}{4} \times 288 \text{ pm}$
 - $\frac{4}{\sqrt{3}} \times 288 \text{ pm}$
- 89.** Which one of the following has maximum number of atoms?
- 1g of Li(s) [Atomic mass of Li = 7]
 - 1g of Ag(s) [Atomic mass of Ag = 108]
 - 1g of Mg(s) [Atomic mass of Mg = 24]
 - 1g of $\text{O}_2\text{(g)}$ [Atomic mass of O = 16]
- 90.** On electrolysis of dil. sulphuric acid using Platinum (Pt) electrode, the product obtained at anode will be:
- SO_2 gas
 - Hydrogen gas
 - Oxygen gas
 - H_2S gas

91. The transverse section of a plant shows following anatomical features:
 (a) Large number of scattered vascular bundles surrounded by bundle sheath.
 (b) Large conspicuous parenchymatous ground tissue.
 (c) Vascular bundles conjoint and closed.
 (d) Phloem parenchyma absent.
 Identify the category of plant and its part :-
 (1) Dicotyledonous root
 (2) Monocotyledonous stem
 (3) Monocotyledonous root
 (4) Dicotyledonous stem
92. Which of the following would help in prevention of diuresis ?
 (1) Decrease in secretion of renin by JG cells
 (2) More water reabsorption due to undersecretion of ADH
 (3) Reabsorption of Na^+ and water from renal tubules due to aldosterone
 (4) Atrial natriuretic factor causes vasoconstriction
93. Which of the following statements is **not correct** ?
 (1) Genetically engineered insulin is produced in *E-Coli*.
 (2) In man insulin is synthesised as a proinsulin.
 (3) The proinsulin has an extra peptide called C-peptide.
 (4) The functional insulin has A and B chains linked together by hydrogen bonds.
94. Embryological support for evolution was disapproved by :
 (1) Oparin
 (2) Karl Ernst von Baer
 (3) Alfred Wallace
 (4) Charles Darwin
95. Goblet cells of alimentary canal are modified from :
 (1) Compound epithelial cells
 (2) Squamous epithelial cells
 (3) Columnar epithelial cells
 (4) Chondrocytes
96. The QRS complex in a standard ECG represents:
 (1) Repolarisation of ventricles
 (2) Repolarisation of auricles
 (3) Depolarisation of auricles
 (4) Depolarisation of ventricles

97. In light reaction, plastoquinone facilitates the transfer of electrons from :
 (1) PS-I to ATP synthase
 (2) PS-II to Cytb₆f complex
 (3) Cytb₆f complex to PS-I
 (4) PS-I to NADP^+
98. The product(s) of reaction catalyzed by nitrogenase in root nodules of leguminous plants is/are :
 (1) Ammonia and hydrogen
 (2) Ammonia alone
 (3) Nitrate alone
 (4) Ammonia and oxygen
99. Match the following with respect to meiosis:
 (a) Zygotene (i) Terminalization
 (b) Pachytene (ii) Chiasmata
 (c) Diplotene (iii) Crossing over
 (d) Diakinesis (iv) Synapsis
 Select the **correct** option from the following:
- | (a) | (b) | (c) | (d) |
|-----------|-------|-------|-------|
| (1) (ii) | (iv) | (iii) | (i) |
| (2) (iii) | (iv) | (i) | (ii) |
| (3) (iv) | (iii) | (ii) | (i) |
| (4) (i) | (ii) | (iv) | (iii) |
100. Match the following columns and select the **correct** option.
- | Column -I | Column -II |
|-------------------------------|----------------------|
| (a) 6 -15 pairs of gill slits | (i) Trygon |
| (b) Heterocercal caudal fin | (ii) Cyclostomes |
| (c) Air Bladder | (iii) Chondrichthyes |
| (d) Poison sting | (iv) Osteichthyes |
- | (a) | (b) | (c) | (d) |
|-----------|-------|-------|------|
| (1) (i) | (iv) | (iii) | (ii) |
| (2) (ii) | (iii) | (iv) | (i) |
| (3) (iii) | (iv) | (i) | (ii) |
| (4) (iv) | (ii) | (iii) | (i) |
101. Which is the important site of formation of glycoproteins and glycolipids in eukaryotic cells ?
 (1) Polysomes
 (2) Endoplasmic reticulum
 (3) Peroxisomes
 (4) Golgi bodies

102. Match the organism with its use in biotechnology.

- | | |
|--------------------------------------|--|
| (a) <i>Bacillus thuringiensis</i> | (i) Cloning vector |
| (b) <i>Thermus aquaticus</i> | (ii) Construction of first rDNA molecule |
| (c) <i>Agrobacterium tumefaciens</i> | (iii) DNA polymerase |
| (d) <i>Salmonella typhimurium</i> | (iv) Cry proteins |

Select the **correct** option from the following:

- | (a) | (b) | (c) | (d) |
|-----------|-------|-------|------|
| (1) (iii) | (iv) | (i) | (ii) |
| (2) (ii) | (iv) | (iii) | (i) |
| (3) (iv) | (iii) | (i) | (ii) |
| (4) (iii) | (ii) | (iv) | (i) |

103. Experimental verification of the chromosomal theory of inheritance was done by:

- | | |
|------------|------------|
| (1) Morgan | (2) Mendel |
| (3) Sutton | (4) Boveri |

104. Match the following :

- | | |
|-------------------------------------|---------------|
| (a) Inhibitor of catalytic activity | (i) Ricin |
| (b) Possess peptide bonds | (ii) Malonate |
| (c) Cell wall material in fungi | (iii) Chitin |
| (d) Secondary metabolite | (iv) Collagen |

Choose the **correct** option from the following :

- | (a) | (b) | (c) | (d) |
|-----------|-------|-------|------|
| (1) (ii) | (iii) | (i) | (iv) |
| (2) (ii) | (iv) | (iii) | (i) |
| (3) (iii) | (i) | (iv) | (ii) |
| (4) (iii) | (iv) | (i) | (ii) |

105. Bilaterally symmetrical and acoelomate animals are exemplified by:

- | | |
|---------------------|-------------------|
| (1) Annelida | (2) Ctenophora |
| (3) Platyhelminthes | (4) Aschelminthes |

106. Floridean starch has structure similar to:

- (1) Laminarin and cellulose
- (2) Starch and cellulose
- (3) Amylopectin and glycogen
- (4) Mannitol and algin

107. Identify the **correct** statement with regard to G₁ phase (Gap 1) of interphase.

- (1) Nuclear Division takes place.
- (2) DNA synthesis or replication takes place.
- (3) Reorganisation of all cell components takes place.
- (4) Cell is metabolically active, grows but does not replicate its DNA.

108. If the head of cockroach is removed, it may live for few days because:

- (1) the head holds a 1/3rd of a nervous system while the rest is situated along the dorsal part of its body.
- (2) the supra-oesophageal ganglia of the cockroach are situated in ventral part of abdomen.
- (3) the cockroach does not have nervous system.
- (4) the head holds a small proportion of a nervous system while the rest is situated along the ventral part of its body.

109. The enzyme enterokinase helps in conversion of:

- (1) pepsinogen into pepsin
- (2) protein into polypeptides
- (3) trypsinogen into trypsin
- (4) caseinogen into casein

110. Match the following columns and select the **correct** option.

- | Column - I | Column - II |
|---------------------|--------------------------------------|
| (a) Organ of Corti | (i) Connects middle ear and pharynx |
| (b) Cochlea | (ii) Coiled part of the labyrinth |
| (c) Eustachian tube | (iii) Attached to the oval window |
| (d) Stapes | (iv) Located on the basilar membrane |

- | (a) | (b) | (c) | (d) |
|-----------|-------|------|-------|
| (1) (i) | (ii) | (iv) | (iii) |
| (2) (ii) | (iii) | (i) | (iv) |
| (3) (iii) | (i) | (iv) | (ii) |
| (4) (iv) | (ii) | (i) | (iii) |

- 111.** Identify the wrong statement with reference to transport of oxygen.
- (1) Low $p\text{CO}_2$ in alveoli favours the formation of oxyhaemoglobin.
 - (2) Binding of oxygen with haemoglobin is mainly related to partial pressure of O_2 .
 - (3) Partial pressure of CO_2 can interfere with O_2 binding with haemoglobin.
 - (4) Higher H^+ conc. in alveoli favours the formation of oxyhaemoglobin.
- 112.** In water hyacinth and water lily, pollination takes place by :
- (1) insects and water
 - (2) insects or wind
 - (3) water currents only
 - (4) wind and water
- 113.** Bt cotton variety that was developed by the introduction of toxin gene of *Bacillus thuringiensis* (Bt) is resistant to :
- (1) Insect predators
 - (2) Insect pests
 - (3) Fungal diseases
 - (4) Plant nematodes
- 114.** Select the correct statement.
- (1) Insulin is associated with hyperglycemia.
 - (2) Glucocorticoids stimulate gluconeogenesis.
 - (3) Glucagon is associated with hypoglycemia.
 - (4) Insulin acts on pancreatic cells and adipocytes.
- 115.** Identify the basic amino acid from the following.
- (1) Valine
 - (2) Tyrosine
 - (3) Glutamic Acid
 - (4) Lysine
- 116.** Flippers of Penguins and Dolphins are examples of:
- (1) Natural selection
 - (2) Adaptive radiation
 - (3) Convergent evolution
 - (4) Industrial melanism
- 117.** From his experiments, S.L. Miller produced amino acids by mixing the following in a closed flask :
- (1) CH_3 , H_2 , NH_3 and water vapour at 600°C
 - (2) CH_4 , H_2 , NH_3 and water vapour at 800°C
 - (3) CH_3 , H_2 , NH_4 and water vapour at 800°C
 - (4) CH_4 , H_2 , NH_3 and water vapour at 600°C
- 118.** The specific palindromic sequence which is recognized by EcoRI is :
- (1) $5' - \text{GGATCC} - 3'$
 $3' - \text{CCTAGG} - 5'$
 - (2) $5' - \text{GAATTC} - 3'$
 $3' - \text{CTTAAG} - 5'$
 - (3) $5' - \text{GGAACC} - 3'$
 $3' - \text{CCTTGG} - 5'$
 - (4) $5' - \text{CTTAAG} - 3'$
 $3' - \text{GAATTC} - 5'$
- 119.** Secondary metabolites such as nicotine, strychnine and caffeine are produced by plants for their :
- (1) Effect on reproduction
 - (2) Nutritive value
 - (3) Growth response
 - (4) Defence action
- 120.** Presence of which of the following conditions in urine are indicative of Diabetes Mellitus ?
- (1) Renal calculi and Hyperglycaemia
 - (2) Uremia and Ketonuria
 - (3) Uremia and Renal Calculi
 - (4) Ketonuria and Glycosuria
- 121.** Which of the following statements are true for the phylum-Chordata ?
- (a) In Urochordata notochord extends from head to tail and it is present throughout their life.
 - (b) In Vertebrata notochord is present during the embryonic period only.
 - (c) Central nervous system is dorsal and hollow.
 - (d) Chordata is divided into 3 subphyla : Hemichordata, Tunicata and Cephalochordata.
- (1) (b) and (c)
 - (2) (d) and (c)
 - (3) (c) and (a)
 - (4) (a) and (b)
- 122.** Cuboidal epithelium with brush border of microvilli is found in :
- (1) eustachian tube
 - (2) lining of intestine
 - (3) ducts of salivary glands
 - (4) proximal convoluted tubule of nephron

- 123.** Match the following columns and select the correct option.

Column - I		Column - II	
(a) <i>Clostridium butylicum</i>		(i) Cyclosporin - A	
(b) <i>Trichoderma polysporum</i>		(ii) Butyric Acid	
(c) <i>Monascus purpureus</i>		(iii) Citric Acid	
(d) <i>Aspergillus niger</i>		(iv) Blood cholesterol lowering agent	

(a)	(b)	(c)	(d)
(1) (iv)	(iii)	(ii)	(i)
(2) (iii)	(iv)	(ii)	(i)
(3) (ii)	(i)	(iv)	(iii)
(4) (i)	(ii)	(iv)	(iii)

- 124.** Which of the following is correct about viroids ?

- (1) They have free DNA without protein coat.
- (2) They have RNA with protein coat.
- (3) They have free RNA without protein coat.
- (4) They have DNA with protein coat.

- 125.** The body of the ovule is fused within the funicle at:

- (1) Chalaza
- (2) Hilum
- (3) Micropyle
- (4) Nucellus

- 126.** The oxygenation activity of RuBisCo enzyme in photorespiration leads to the formation of :

- (1) 1 molecule of 4-C compound and 1 molecule of 2-C compound.
- (2) 2 molecules of 3-C compound
- (3) 1 molecule of 3-C compound
- (4) 1 molecule of 6-C compound

- 127.** Match the following columns and select the correct option.

Column - I		Column - II	
(a) Eosinophils		(i) Immune response	
(b) Basophils		(ii) Phagocytosis	
(c) Neutrophils		(iii) Release histaminase, destructive enzymes	
(d) Lymphocytes		(iv) Release granules containing histamine	

(a)	(b)	(c)	(d)
(1) (ii)	(i)	(iii)	(iv)
(2) (iii)	(iv)	(ii)	(i)
(3) (iv)	(i)	(ii)	(iii)
(4) (i)	(ii)	(iv)	(iii)

- 128.** Which of the following hormone levels will cause release of ovum (ovulation) from the graffian follicle?

- (1) Low concentration of FSH
- (2) High concentration of Estrogen
- (3) High concentration of Progesterone
- (4) Low concentration of LH

- 129.** Select the correct events that occur during inspiration.

- (a) Contraction of diaphragm
 - (b) Contraction of external inter-costal muscles
 - (c) Pulmonary volume decreases
 - (d) Intra pulmonary pressure increases
- (1) only (d)
 - (2) (a) and (b)
 - (3) (c) and (d)
 - (4) (a), (b) and (d)

- 130.** In which of the following techniques, the embryos are transferred to assist those females who can not conceive?

- (1) GIFT and ICSI
- (2) ZIFT and IUT
- (3) GIFT and ZIFT
- (4) ICSI and ZIFT

- 131.** The infectious stage of *Plasmodium* that enters the human body is :

- (1) Male gametocytes
- (2) Trophozoites
- (3) Sporozoites
- (4) Female gametocytes

- 132.** Match the following columns and select the correct option.

Column-I	Column-II
(a) Placenta	(i) Androgens
(b) Zona pellucida	(ii) Human Chorionic Gonadotropin(hCG)
(c) Bulbo-urethral glands	(iii) Layer of the ovum
(d) Leydig cells	(iv) Lubrication of the Penis

(a)	(b)	(c)	(d)
(1) (ii)	(iii)	(iv)	(i)
(2) (iv)	(iii)	(i)	(ii)
(3) (i)	(iv)	(ii)	(iii)
(4) (iii)	(ii)	(iv)	(i)

- 133.** Select the correct match.

- (1) Thalassemia - X linked
- (2) Haemophilia - Y linked
- (3) Phenylketonuria - Autosomal dominant trait
- (4) Sickle cell anaemia - Autosomal recessive trait, chromosome-11

134. Which of the following statements is **correct** ?

- (1) Adenine does not pair with thymine
- (2) Adenine pairs with thymine through two H-bonds
- (3) Adenine pairs with thymine through one H-bond
- (4) Adenine pairs with thymine through three H-bonds

135. Which of the following is the most abundant protein in the animals ?

- (1) Insulin
- (2) Haemoglobin
- (3) Collagen
- (4) Lectin

136. Which of the following pairs is of unicellular algae?

- (1) *Chlorella* and *Spirulina*
- (2) *Laminaria* and *Sargassum*
- (3) *Gelidium* and *Gracilaria*
- (4) *Anabaena* and *Volvox*

137. The plant parts which consist of two generations one within the other :

- (a) Pollen grains inside the anther
- (b) Germinated pollen grain with two male gametes
- (c) Seed inside the fruit
- (d) Embryo sac inside the ovule
- (1) (a) and (d)
- (2) (a) only
- (3) (a), (b) and (c)
- (4) (c) and (d)

138. Identify the **incorrect** statement.

- (1) Due to deposition of tannins, resins, oils etc., heart wood is dark in colour
- (2) Heart wood does not conduct water but gives mechanical support
- (3) Sapwood is involved in conduction of water and minerals from root to leaf
- (4) Sapwood is the innermost secondary xylem and is lighter in colour

139. By which method was a new breed 'Hisardale' of sheep formed by using Bikaneri ewes and Marino rams ?

- (1) Inbreeding
- (2) Out crossing
- (3) Mutational breeding
- (4) Cross breeding

140. Some dividing cells exit the cell cycle and enter vegetative inactive stage. This is called quiescent stage (G_0). This process occurs at the end of :

- (1) G_2 phase
- (2) M phase
- (3) G_1 phase
- (4) S phase

141. Identify the **correct** statement with reference to human digestive system.

- (1) Vermiform appendix arises from duodenum
- (2) Ileum opens into small intestine
- (3) Serosa is the innermost layer of the alimentary canal
- (4) Ileum is highly coiled part

142. Which of the following refer to **correct** example(s) of organisms which have evolved due to changes in environment brought about by anthropogenic action?

- (a) Darwin's Finches of Galapagos islands.
- (b) Herbicide resistant weeds.
- (c) Drug resistant eukaryotes.
- (d) Man-created breeds of domesticated animals like dogs.

(1) Only (d)

(2) Only (a)

(3) (a) and (c)

(4) (b), (c) and (d)

143. Match the following columns and select the **correct** option :

Column-I		Column-II	
(a) Pituitary gland		(i) Grave's disease	
(b) Thyroid gland		(ii) Diabetes mellitus	
(c) Adrenal gland		(iii) Diabetes insipidus	
(d) Pancreas		(iv) Addison's disease	
(a)	(b)	(c)	(d)
(1) (ii)	(i)	(iv)	(iii)
(2) (iv)	(iii)	(i)	(ii)
(3) (iii)	(ii)	(i)	(iv)
(4) (iii)	(i)	(iv)	(ii)

144. Select the option including all sexually transmitted diseases.

- (1) Cancer, AIDS, Syphilis
- (2) Gonorrhoea, Syphilis, Genital herpes
- (3) Gonorrhoea, Malaria, Genital herpes
- (4) AIDS, Malaria, Filariasis

145. The number of substrate level phosphorylations in one turn of citric acid cycle is :

- (1) Three
- (2) Zero
- (3) One
- (4) Two

146. Montreal protocol was signed in 1987 for control of :

- (1) Disposal of e-wastes
- (2) Transport of Genetically modified organisms from one country to another
- (3) Emission of ozone depleting substances
- (4) Release of Green House gases

147. Match the following concerning essential elements and their functions in plants :

- | | |
|---------------|---|
| (a) Iron | (i) Photolysis of water |
| (b) Zinc | (ii) Pollen germination |
| (c) Boron | (iii) Required for chlorophyll biosynthesis |
| (d) Manganese | (iv) IAA biosynthesis |

Select the **correct** option :

- | (a) | (b) | (c) | (d) |
|-----------|-------|------|-------|
| (1) (iv) | (i) | (ii) | (iii) |
| (2) (ii) | (i) | (iv) | (iii) |
| (3) (iv) | (iii) | (ii) | (i) |
| (4) (iii) | (iv) | (ii) | (i) |

148. Match the following columns and select the **correct** option.

Column-I

Column-II

- | | |
|--|-------------------------|
| (a) Gregarious, polyphagous pest | (i) <i>Asterias</i> |
| (b) Adult with radial symmetry and larva with bilateral symmetry | (ii) Scorpion |
| (c) Book lungs | (iii) <i>Ctenoplane</i> |
| (d) Bioluminescence | (iv) <i>Locusta</i> |

- | (a) | (b) | (c) | (d) |
|-----------|-------|-------|-------|
| (1) (ii) | (i) | (iii) | (iv) |
| (2) (i) | (iii) | (ii) | (iv) |
| (3) (iv) | (i) | (ii) | (iii) |
| (4) (iii) | (ii) | (i) | (iv) |

149. According to Robert May, the global species diversity is about :

- | | |
|----------------|-----------------|
| (1) 7 million | (2) 1.5 million |
| (3) 20 million | (4) 50 million |

150. Ray florets have :

- (1) Half inferior ovary
- (2) Inferior ovary
- (3) Superior ovary
- (4) Hypogynous ovary

151. If the distance between two consecutive base pairs is 0.34 nm and the total number of base pairs of a DNA double helix in a typical mammalian cell is 6.6×10^9 bp, then the length of the DNA is approximately :

- | | |
|----------------|----------------|
| (1) 2.7 meters | (2) 2.0 meters |
| (3) 2.5 meters | (4) 2.2 meters |

152. Match the following columns and select the **correct** option.

Column - I

Column - II

- | | |
|------------------------------------|------------------------------------|
| (a) Bt cotton | (i) Gene therapy |
| (b) Adenosine deaminase deficiency | (ii) Cellular defence |
| (c) RNAi | (iii) Detection of HIV infection |
| (d) PCR | (iv) <i>Bacillus thuringiensis</i> |

- | (a) | (b) | (c) | (d) |
|-----------|-------|-------|-------|
| (1) (i) | (ii) | (iii) | (iv) |
| (2) (iv) | (i) | (ii) | (iii) |
| (3) (iii) | (ii) | (i) | (iv) |
| (4) (ii) | (iii) | (iv) | (i) |

153. Match the trophic levels with their **correct** species examples in grassland ecosystem.

- | | |
|--------------------------|--------------|
| (a) Fourth trophic level | (i) Crow |
| (b) Second trophic level | (ii) Vulture |
| (c) First trophic level | (iii) Rabbit |
| (d) Third trophic level | (iv) Grass |

Select the **correct** option :

- | (a) | (b) | (c) | (d) |
|-----------|-------|-------|------|
| (1) (i) | (ii) | (iii) | (iv) |
| (2) (ii) | (iii) | (iv) | (i) |
| (3) (iii) | (ii) | (i) | (iv) |
| (4) (iv) | (iii) | (ii) | (i) |

154. Match the following diseases with the causative organism and select the **correct** option.

Column - I

Column - II

- | | |
|----------------|-------------------------|
| (a) Typhoid | (i) <i>Wuchereria</i> |
| (b) Pneumonia | (ii) <i>Plasmodium</i> |
| (c) Filariasis | (iii) <i>Salmonella</i> |
| (d) Malaria | (iv) <i>Haemophilus</i> |

- | (a) | (b) | (c) | (d) |
|-----------|-------|-------|-------|
| (1) (iv) | (i) | (ii) | (iii) |
| (2) (i) | (iii) | (ii) | (iv) |
| (3) (iii) | (iv) | (i) | (ii) |
| (4) (ii) | (i) | (iii) | (iv) |

155. The roots that originate from the base of the stem are :

- | | |
|-------------------|-------------------|
| (1) Lateral roots | (2) Fibrous roots |
| (3) Primary roots | (4) Prop roots |

- 156.** Meiotic division of the secondary oocyte is completed :
- (1) At the time of fusion of a sperm with an ovum
 - (2) Prior to ovulation
 - (3) At the time of copulation
 - (4) After zygote formation
- 157.** Identify the **wrong** statement with regard to Restriction Enzymes.
- (1) Sticky ends can be joined by using DNA ligases.
 - (2) Each restriction enzyme functions by inspecting the length of a DNA sequence.
 - (3) They cut the strand of DNA at palindromic sites.
 - (4) They are useful in genetic engineering.
- 158.** In relation to Gross primary productivity and Net primary productivity of an ecosystem, which one of the following statements is **correct** ?
- (1) There is no relationship between Gross primary productivity and Net primary productivity.
 - (2) Gross primary productivity is always less than net primary productivity.
 - (3) Gross primary productivity is always more than net primary productivity.
 - (4) Gross primary productivity and Net primary productivity are one and same.
- 159.** The process of growth is maximum during :
- (1) Dormancy
 - (2) Log phase
 - (3) Lag phase
 - (4) Senescence
- 160.** The sequence that controls the copy number of the linked DNA in the vector, is termed :
- (1) Recognition site
 - (2) Selectable marker
 - (3) Ori site
 - (4) Palindromic sequence
- 161.** Name the enzyme that facilitates opening of DNA helix during transcription.
- (1) RNA polymerase
 - (2) DNA ligase
 - (3) DNA helicase
 - (4) DNA polymerase
- 162.** Snow-blindness in Antarctic region is due to :
- (1) Damage to retina caused by infra-red rays
 - (2) Freezing of fluids in the eye by low temperature
 - (3) Inflammation of cornea due to high dose of UV-B radiation
 - (4) High reflection of light from snow
- 163.** Strobili or cones are found in :
- (1) *Equisetum*
 - (2) *Salvinia*
 - (3) *Pteris*
 - (4) *Marchantia*
- 164.** Match the following columns and select the **correct** option.
- | Column - I | Column - II |
|--------------------|---|
| (a) Floating Ribs | (i) Located between second and seventh ribs |
| (b) Acromion | (ii) Head of the Humerus |
| (c) Scapula | (iii) Clavicle |
| (d) Glenoid cavity | (iv) Do not connect with the sternum |
- | (a) | (b) | (c) | (d) |
|-----------|-------|------|-------|
| (1) (iv) | (iii) | (i) | (ii) |
| (2) (ii) | (iv) | (i) | (iii) |
| (3) (i) | (iii) | (ii) | (iv) |
| (4) (iii) | (ii) | (iv) | (i) |
- 165.** Which of the following is put into Anaerobic sludge digester for further sewage treatment ?
- (1) Activated sludge
 - (2) Primary sludge
 - (3) Floating debris
 - (4) Effluents of primary treatment
- 166.** Identify the wrong statement with reference to the gene 'I' that controls ABO blood groups.
- (1) Allele 'i' does not produce any sugar.
 - (2) The gene (I) has three alleles.
 - (3) A person will have only two of the three alleles.
 - (4) When I^A and I^B are present together, they express same type of sugar.

- 167.** The ovary is half inferior in :
 (1) Plum (2) Brinjal
 (3) Mustard (4) Sunflower
- 168.** The first phase of translation is :
 (1) Recognition of an anti-codon
 (2) Binding of mRNA to ribosome
 (3) Recognition of DNA molecule
 (4) Aminoacylation of tRNA
- 169.** In gel electrophoresis, separated DNA fragments can be visualized with the help of :
 (1) Ethidium bromide in infrared radiation
 (2) Acetocarmine in bright blue light
 (3) Ethidium bromide in UV radiation
 (4) Acetocarmine in UV radiation
- 170.** Dissolution of the synaptonemal complex occurs during :
 (1) Leptotene (2) Pachytene
 (3) Zygotene (4) Diplotene
- 171.** Identify the substances having glycosidic bond and peptide bond, respectively in their structure :
 (1) Inulin, insulin (2) Chitin, Cholesterol
 (3) Glycerol, trypsin (4) Cellulose, lecithin
- 172.** Name the plant growth regulator which upon spraying on sugarcane crop, increases the length of stem, thus, increasing the yield of sugarcane crop.
 (1) Absciscic acid (2) Cytokinin
 (3) Gibberellin (4) Ethylene
- 173.** Which of the following statements about inclusion bodies is **incorrect** ?
 (1) These represent reserve material in cytoplasm.
 (2) They are not bound by any membrane.
 (3) These are involved in ingestion of food particles.
 (4) They lie free in the cytoplasm.
- 174.** Which of the following regions of the globe exhibits highest species diversity?
 (1) Amazon forests
 (2) Western Ghats of India
 (3) Madagascar
 (4) Himalayas
- 175.** How many true breeding pea plant varieties did Mendel select as pairs, which were similar except in one character with contrasting traits?
 (1) 8 (2) 4
 (3) 2 (4) 14
- 176.** Identify the **wrong** statement with reference to immunity.
 (1) Foetus receives some antibodies from mother, it is an example for passive immunity.
 (2) When exposed to antigen (living or dead) antibodies are produced in the host's body. It is called "Active immunity".
 (3) When ready-made antibodies are directly given, it is called "Passive immunity".
 (4) Active immunity is quick and gives full response.
- 177.** Which of the following is **not** an attribute of a population?
 (1) Species interaction
 (2) Sex ratio
 (3) Natality
 (4) Mortality
- 178.** Choose the **correct** pair from the following:
 (1) Exonucleases : Make cuts at specific positions within DNA
 (2) Ligases : Join the two DNA molecules
 (3) Polymerases : Break the DNA into fragments
 (4) Nucleases : Separate the two strands of DNA
- 179.** The process responsible for facilitating loss of water in liquid form the tip of grass blades at night and in early morning is :
 (1) Plasmolysis (2) Transpiration
 (3) Root pressure (4) Imbibition
- 180.** Which of the following is **not** an inhibitory substance governing seed dormancy?
 (1) Para-ascorbic acid (2) Gibberellic acid
 (3) Absciscic acid (4) Phenolic acid

ANSWER KEY

NEET(UG)-2020

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	1	4	3	3	4	4	3	2	1	4	3	1	3	2	2
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	3	4	3	2	1	4	2	3	1	3	4	3	4	2	3
Que.	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Ans.	4	3	4	1	1	1	3	4	4	4	4	2	3	1	2
Que.	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ans.	2	1	4	4	3	2	4	2	2	4	4	1	4	3	4
Que.	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Ans.	2	4	1	1	3	1	2	2	1	2	4	3	2	1	2
Que.	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
Ans.	2	4	2	2	1	1	1	1	3	4	4	4	2	1	3
Que.	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105
Ans.	2	3	4	2	3	4	2	1	3	2	4	3	1	2	3
Que.	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
Ans.	3	4	4	3	4	4	2	2	2	4	3	2	2	4	4
Que.	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135
Ans.	1	4	3	3	2	3	2	2	2	2	3	1	4	2	3
Que.	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
Ans.	1	1	4	4	3	4	4	4	2	3	3	4	3	1	2
Que.	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165
Ans.	4	2	2	3	2	1	1	3	2	3	1	3	1	1	1
Que.	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
Ans.	4	1	4	3	4	1	3	3	1	4	4	1	2	3	2

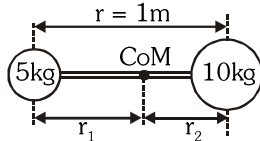
HINT - SHEET

- $R = 47 \times 10^1 \pm 5\% = 470 \Omega, 5\%$
- $\vec{F} = 3\hat{j}N, \vec{r} = 2\hat{k}$
 $\vec{\tau} = \vec{r} \times \vec{F} = 2\hat{k} \times 3\hat{j} = 6(\hat{k} \times \hat{j}) = 6(-\hat{i}) = -6\hat{i} \text{ Nm}$
- For an ideal gas sample

$$\frac{P}{\rho} = \frac{RT}{M_w}$$

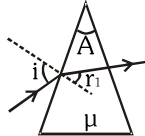
$$\rho = \frac{PM_w}{RT} = \frac{249 \times 10^3 \times 2 \times 10^{-3}}{8.314 \times 300} = 0.199$$

$$\rho \approx 0.2 \text{ kg/m}^3$$
- Free expansion i.e. expansion against vacuum is adiabatic in nature for all type of gases. It should be noted that final temperature is equal to initial temperature for ideal gases.

- 

About CoM, $mr = \text{constant} \Rightarrow r \propto \frac{1}{m}$

$$\Rightarrow \frac{r_1}{r_2} = \frac{m_2}{m_1} = \frac{10}{5} = \frac{2}{1}$$

$$\Rightarrow r_1 = \frac{2}{3}r = \frac{2}{3} \times 1\text{m} = 67\text{cm}$$
- 

Here $r_2 = 0$ so $r_1 = A$

Apply Snell's law $\sin i = \mu \sin r_1 = \mu \sin A$

for small angle $i = \mu A$

7. $W_s = mg_s = 72 \text{ N}$

$$W_h = mg_h = \frac{mg_s}{\left(1 + \frac{h}{R}\right)^2} = \frac{72 \text{ N}}{\left(1 + \frac{R/2}{R}\right)^2} = \frac{72}{9/4}$$

$$W_h = 32 \text{ N}$$

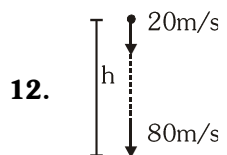
8. $\mu_r = \chi_m + 1 = 599 + 1 = 600$

$$\mu = \mu_0 \mu_r = 4\pi \times 10^{-7} \times 600 = 2.4\pi \times 10^{-4} \frac{\text{Tm}}{\text{A}}$$

9. Base region is very thin and lightly doped.

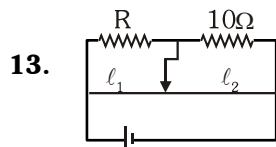
10. $I = \frac{E}{At} \Rightarrow E = IAt = \frac{20}{10^{-4}} \times 20 \times 10^{-4} \times 60$
 $= 24 \times 10^3 \text{ J}$

11. $V = \frac{kP \cos \theta}{r^2} = \frac{9 \times 10^9 \times 16 \times 10^{-9} (1/2)}{(0.6)^2} = 200 \text{ V}$



$$\therefore v^2 = u^2 + 2gh$$

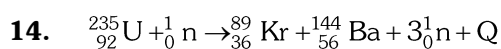
$$\therefore 80^2 = 20^2 + 2 \times 10h \Rightarrow h = 300 \text{ m}$$



$$\frac{R}{10} = \frac{\ell_1}{\ell_2} \Rightarrow \frac{R}{10} = \frac{3}{2} \Rightarrow R = 15\Omega$$

Length of 15Ω resistance wire is 1.5 m

$$\therefore \text{length of } 1\Omega \text{ resistance wire} = \frac{1.5}{15} = 0.1 \text{ m}$$



15. $B = \mu_0 \frac{N}{\ell} I$

$$= 4\pi \times 10^{-7} \times \frac{100}{(0.5)} \times 2.5$$

$$= 6.28 \times 10^{-4} \text{ T}$$

16. Average thermal energy = $\frac{3}{2} K_B T$

where 3 is translational degree of freedom

For monoatomic gas total degree of freedom

$f = 3$ (translational degree of freedom)

17. $m \propto r \Rightarrow \frac{m_2}{m_1} = \frac{r_2}{r_1} \Rightarrow \frac{m_2}{5} = \frac{2r}{r} \Rightarrow m_2 = 10 \text{ g}$

18. In EMW, electric field and magnetic field have same energy density and same intensities.

19. Limit of resolution = $\frac{1.22\lambda}{a}$
 $= \frac{1.22 \times 6 \times 10^{-7}}{2}$
 $= 3.66 \times 10^{-7} \text{ rad}$

20. $Y = \frac{FL}{A\Delta L} = \frac{MgL}{A(L_1 - L)}$

21. $E = \frac{10^{-20}}{1.6 \times 10^{-19}} \text{ eV} = 0.0625 \text{ eV}$

22. Potential is constant throughout the volume
 \therefore Electric field is zero.

23. Mean free path for a gas sample

$$\lambda_m = \frac{1}{\sqrt{2} \pi d^2 n}$$

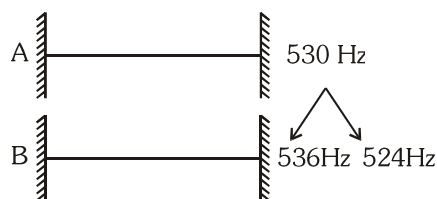
where d is diameter of a gas molecule and n is molecular density

24. $\lambda = 1.227 \times 10^{-2} \text{ nm} = 0.1227 \text{ \AA}$

$$\lambda = \frac{12.27}{\sqrt{V}} \text{ \AA} \Rightarrow 0.1227 = \frac{12.27}{\sqrt{V}} \text{ \AA}$$

$$\Rightarrow \sqrt{V} = 10^2 \Rightarrow V = 10^4 \text{ volt}$$

25. Guitar string i.e. string is fixed from both ends



$$\text{Frequency} \propto \sqrt{\text{Tension}}$$

If tension in B slightly decrease then frequency of B decrease.

If B is 536 Hz, as the frequency decreases, beats with A also decreases.

If B is 524 Hz, as the frequency decreases, beats with A increases.

\therefore Original frequency of B will be 524 Hz.

$$26. I = \frac{V}{X_C} = \frac{V}{1/C\omega} = VC\omega$$

$$= 200 \times 40 \times 10^{-6} \times 2\pi \times 50$$

$$= 2.5 \text{ A}$$

27. In reverse bias external battery attract majority charge carriers.
so width of the depletion region increase

$$28. \tan i_b = \frac{\mu_2}{\mu_1} = \frac{\mu_2}{1}$$

$$\because \mu_2 > 1 \therefore \tan i_b > 1 \Rightarrow 90^\circ > i_b > 45^\circ$$

29. Displacement (x) equation of SHM

$$x = A \sin (\omega t + \phi) \quad \dots(1)$$

$$\frac{dx}{dt} = A\omega \cos (\omega t + \phi)$$

$$\text{acceleration (a)} = \frac{d^2x}{dt^2}$$

$$a = -\omega^2 A \sin(\omega t + \phi)$$

$$a = \omega^2 A \sin (\omega t + \phi + \pi) \quad \dots(2)$$

from (1) & (2), phase difference between displacement and acceleration is π .

$$30. E = \frac{kQ}{r^2} = \frac{9 \times 10^9 \times 3.2 \times 10^{-7}}{(15 \times 10^{-2})^2}$$

$$E = 1.28 \times 10^5 \text{ N/C}$$

$$31. C_m = \epsilon_r C_o \Rightarrow \epsilon_r = \frac{30}{6} = 5$$

$$\epsilon = \epsilon_0 \epsilon_r = 8.85 \times 10^{-12} \times 5 = 0.44 \times 10^{-10}$$

32. In subtraction the number of decimal places in the result should be equal to the number of decimal places of that term in the operation which contain lesser number of decimal places.

$$9.99$$

$$-0.0099$$

$$\hline 9.98$$

$$33. \text{ When L removed } \tan \phi = \frac{X_C}{R}$$

$$\text{When L removed } \tan \phi = \frac{X_L}{R}$$

$$\frac{X_C}{R} = \frac{X_L}{R} \Rightarrow \text{Resonance} \Rightarrow Z = R$$

$$\cos \phi = \frac{R}{Z} = \frac{R}{R} = 1$$

$$34. [\text{stress}] = \left[\frac{\text{Force}}{\text{Area}} \right] = \left[\frac{M^1 L^1 T^{-2}}{L^2} \right] = M^1 L^{-1} T^{-2}$$

$$35. K_1 = 1.5 h\nu_0 - \phi_0 = 0.5 h\nu_0$$

$$K_2 = \frac{1.5}{2} h\nu_0 - h\nu_0 = -0.25 h\nu_0$$

Kinetic energy can never be negative

So, no emission and $i = 0$

OR

In second case the incident frequency is halved

$$\text{Incident frequency} = \frac{1.5}{2} \nu_0 = 0.75 \nu_0$$

Now the incident frequency is less than threshold frequency so no emission of electron take place therefore no current.

($i = 0$)

36. In semiconductors and insulators, the number of charge carries per unit volume increases with an increase in temperature, so α is negative for these.

$$37. \mu = \frac{v_d}{E} = \frac{7.5 \times 10^{-4}}{3 \times 10^{-10}} = 2.5 \times 10^6$$

38. For some metals like copper, resistivity is nearly proportional to temperature although a non linear region always exists at very low temperature.

39. Acceleration of system

$$a = \frac{(m_2 - m_1)g}{m_1 + m_2} = \frac{(6 - 4)g}{6 + 4} = \frac{2g}{10} = \frac{g}{5}$$

$$40. \text{ L.C.} = \frac{\text{Pitch}}{\text{Number of division on circular scale}}$$

$$\Rightarrow 0.01 \text{ mm} = \frac{\text{Pitch}}{50} \Rightarrow \text{Pitch} = 0.5 \text{ mm}$$

$$41. \text{ Here } \beta = \frac{\lambda D}{d} \text{ \& } \beta' = \frac{\lambda D'}{d'}$$

$$\text{Where } D' = 2D, d' = \frac{d}{2}$$

$$\Rightarrow \beta' = \frac{\lambda \times 2D}{d/2} = \frac{4\lambda D}{d}$$

$$\Rightarrow \beta' = 4\beta$$

Fringe width becomes 4 times

42. $Y = \overline{A+B} = \overline{A} \cdot \overline{B} = A \cdot B = \text{AND gate}$

A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

43. $E = mc^2$

$$= 0.5 \times 10^{-3} \times 9 \times 10^{16}$$

$$= 4.5 \times 10^{13} \text{ J}$$

44. Bohr model is applicable for only single electron species.

45. Heat supplied $\Delta Q = Ms\Delta T$

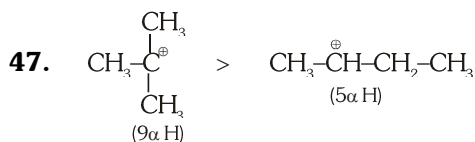
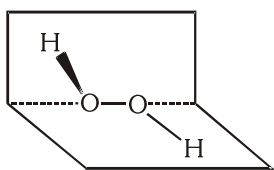
For same material 's' same.

$$\Delta Q \propto M \text{ and } M = \frac{4}{3}\pi r^3 \rho \Rightarrow \Delta Q \propto r^3$$

$$\frac{\Delta Q_1}{\Delta Q_2} = \left(\frac{r_1}{r_2}\right)^3 = \left(\frac{1.5}{1}\right)^3 = \frac{27}{8}$$

- 46.

- (a) $\text{CO} + \text{H}_2$... (iii) synthesis gas
 (b) Temporary Hardness... (i) $\text{Mg}(\text{HCO}_3)_2 + \text{Ca}(\text{HCO}_3)_2$
 (c) B_2H_6 ... (ii) Electron deficient ($6e^-$)
 (d) H_2O_2 ... (iv) Non-planar structure



Tert. Butyl
Carbocation

Sec. Butyl carbocation



More stable due to Hyperconjugation effect.

48. $\text{CH}_4(\text{g}) + 4\text{Cl}_2(\text{g}) \rightarrow \text{CCl}_4(\text{l}) + 4\text{HCl}(\text{g})$

$$\underline{\text{C}}\text{H}_4(-4) \Rightarrow \text{C} + 4(+1) = 0 \Rightarrow \text{C} = -4$$

$$\underline{\text{C}}\text{Cl}_4(+4) \Rightarrow \text{C} + 4(-1) = 0 \Rightarrow \text{C} = +4$$

$$-4 \text{ to } +4$$

49. Sucrose $\xrightarrow[\text{(Hydrolysis)}]{\text{H}_3\text{O}^+} \alpha\text{-D-Glucose} + \beta\text{-D-Fructose}$

50. $\text{Cr}^{+2} = 3d^4$

1	1	1	1	
---	---	---	---	--

n=4

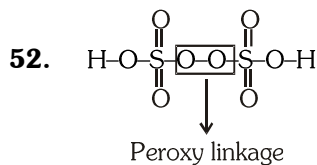
$$\mu = \sqrt{n(n+2)} \text{ B.M.} = \sqrt{4(6)} = \sqrt{24} \text{ B.M.}$$

$$= 4.90 \text{ B.M.}$$

51. $\text{He}_2 = \text{Total electron} = 4$

$$= \sigma_{1s}^2 \sigma_{1s}^{*2} \Rightarrow \text{B.O.} = \frac{1}{2}[\text{Nb} - \text{Na}] = \frac{1}{2}[2 - 2] = 0$$

Bond order = 0, so He_2 does not exist.



53. According to spectrochemical series.

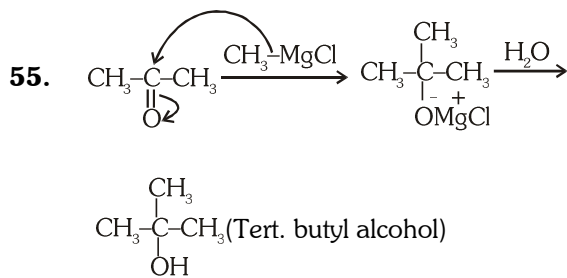
54. $\text{Ca}^{+2} + 2e^- \rightarrow \text{Ca}_{(s)}$

$$\text{v.f.} = 2$$

As per faraday's 1st law

Charge passed in faraday = g.eq of product

$$= \frac{20}{40} \times 2 = 1\text{F}$$



56. $\text{C}_{19}\text{H}_{42}\text{N}^+\text{Br}^-$ (cationic detergent)

12th NCERT (16.5.2)

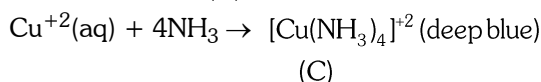
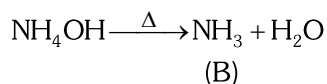
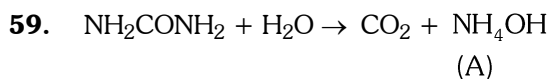
Synthetic detergents

57. Chromate (CrO_4^{-2}) \Rightarrow oxidation state = +6

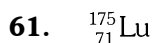
dichromate ($\text{Cr}_2\text{O}_7^{-2}$) \Rightarrow oxidation state = +6

oxidation state are same.

58. n-Heptane can not be made in good yield using Wurtz reaction since it is unsymmetrical alkane.



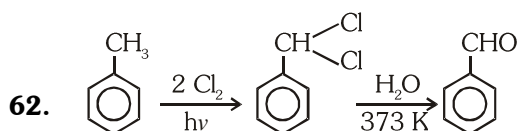
60. $\Delta T_f = K_f \times m$
 $= 5.12 \times 0.078$
 $\Delta T_f = 0.40 \text{ K}$



$p^+ = 71$

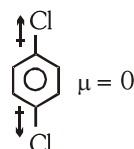
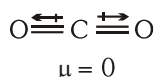
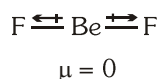
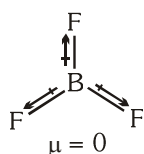
$n^0 = 175 - 71 = 104$

$e^- = 71$



63. Pig iron contains impurities (C, S, Si, P etc) having malleable nature that's why can be moulded.

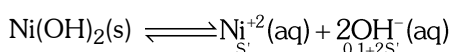
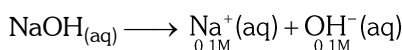
64. BF_3 , BeF_2 , CO_2 & 1, 4 - dichloro benzene all are symmetrical structure.



65. 11th NCERT (12.8.5) chromatography

66. Ununium (Z = 111) it is Röntgenium (Rg) not Darmstadtium.

67. $\alpha = 1$ for NaOH

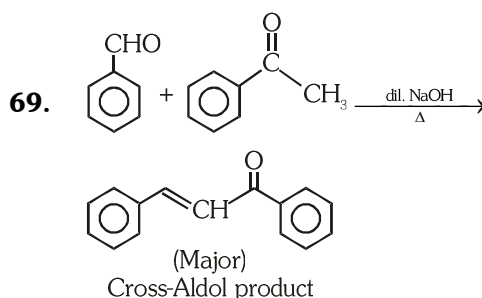


Ionic product = $(\text{S}') (0.1 + 2\text{S}')^2$

$2 \times 10^{-15} = \text{S}'(0.1)^2$

$\text{S}' = 2 \times 10^{-13} \text{ M}$

68. 12th NCERT (15.2.4)



70. Hydrogen bond of ethanol gets weakened by addition of acetone.

71. $k = 4.606 \times 10^{-3} \text{ s}^{-1}$

$kt = 2.303 \log_{10} \frac{2}{0.2}$

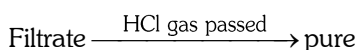
$4.606 \times 10^{-3} \times t = 2.303 \times \log 10$

$t = \frac{1000}{2} = 500 \text{ s}$

72. When HCl is passed through the mixture Cl^- ion concentration increases. Hence ionic product $[\text{Na}^+][\text{Cl}^-]$

becomes more than solubility product.

So NaCl will precipitate out.



NaCl precipitation (common ion effect)

73. free expansion of ideal gas

$P_{\text{ext}} = 0$

$W_{\text{pv}} = 0$

$q = 0$ (adiabatic process)

$\Delta E = q + w$

$\Delta E = 0$

$\Delta E = nC_{\text{vm}} \Delta T = 0$

$q = 0, \Delta T = 0, w = 0$

74. Correct statement are (c) and (d)

(c) use of zeolite (3d-silicate)

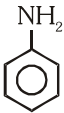
(d) CO-neutral, colourless & odourless gas.

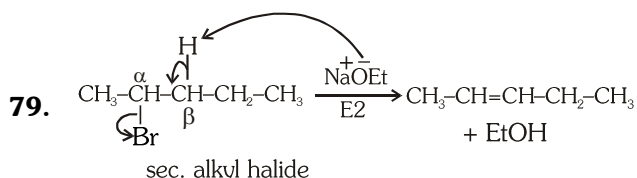
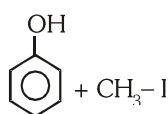
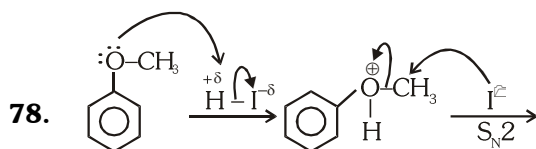
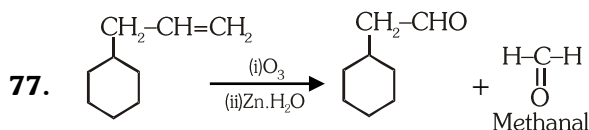
75. $K_c = 2 \times 10^{13}$

$T = 300 \text{ K}$

$\Delta G^\circ = -RT \ln k_{\text{eq}}$

$\Delta G^\circ = -8.314 \text{ J K}^{-1} \text{ mol}^{-1} \times 300 \text{ K} \times \ln (2 \times 10^{13})$

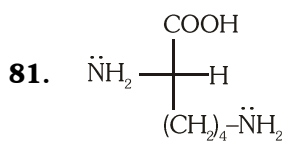
76. Since  is primary amine it gives carbylamine test (isocyanide test)



- * This reaction is an example of β -elimination.
- * Hydrogen is removed from β -carbon and halogen from α -carbon, hence, dehydrohalogenation reaction.
- * Generally in E2 reaction Zaitsev alkene is formed as major product (more stable alkene).

80. Collision frequency

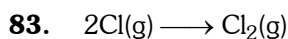
$Z_{12} \propto$ number of reactant molecules per unit volume.



Lysine

Since it contains more number of -NH_2 groups as compared to -COOH groups hence it is basic amino acid.

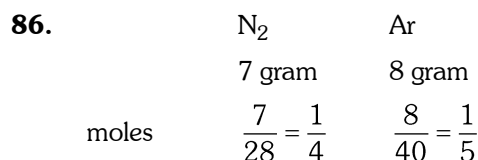
82. Biological importance of sodium & potassium.



$\Delta_r S < 0$ and $\Delta_r H < 0$

84. (a) CO (ii) Neutral
(b) BaO (i) Basic
(c) Al_2O_3 (iv) Amphoteric
(d) Cl_2O_7 (iii) Acidic

85. Greater the Zeta potential more will be the stability of colloidal particles.



(Partial pressure) N_2
 $= P_T \times (\text{mole fraction}) \text{N}_2$
 $= 27 \times \frac{1/4}{1/4 + 1/5}$
 $= 27 \times \frac{1/4}{9/20}$
 $= 27 \times \frac{20}{4 \times 9}$
 $= 3 \times 5$
 $= 15 \text{ bar}$

87. Not correct
Carboxyhaemoglobin (haemoglobin bound to CO) is more stable than oxyhaemoglobin.

88. $\sqrt{3}a = 4r$ (for bcc lattice)
 $r = \frac{\sqrt{3}}{4} \times 288 \text{ pm}$

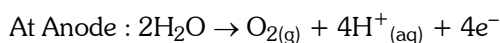
89. Number of atoms

$= \frac{w}{\text{molar mass}} \times N_A \times \text{atomicity}$

(1) $\frac{1}{7} \times N_A \times 1$ (2) $\frac{1}{108} \times N_A \times 1$

(3) $\frac{1}{24} \times N_A \times 1$ (4) $\frac{1}{32} \times N_A \times 2$

90. H_2SO_4



Oxygen gas will liberate at anode

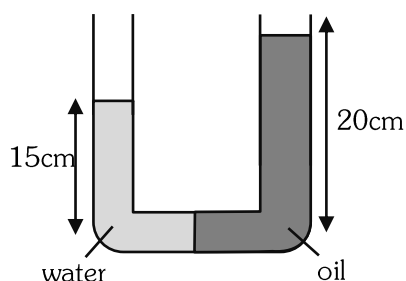
NEET(UG) – 2019 (Odisha)

- Two metal spheres, one of radius R and the other of radius $2R$ respectively have the same surface charge density σ . They are brought in contact and separated. What will be the new surface charge densities on them ?
 (1) $\sigma_1 = \frac{5}{6}\sigma$, $\sigma_2 = \frac{5}{2}\sigma$
 (2) $\sigma_1 = \frac{5}{2}\sigma$, $\sigma_2 = \frac{5}{6}\sigma$
 (3) $\sigma_1 = \frac{5}{2}\sigma$, $\sigma_2 = \frac{5}{3}\sigma$
 (4) $\sigma_1 = \frac{5}{3}\sigma$, $\sigma_2 = \frac{5}{6}\sigma$
- The distance covered by a particle undergoing SHM in one time period is (amplitude = A) :-
 (1) zero (2) A
 (3) $2A$ (4) $4A$
- A mass falls from a height ' h ' and its time of fall ' t ' is recorded in terms of time period T of a simple pendulum. On the surface of earth it is found that $t = 2T$. The entire set up is taken on the surface of another planet whose mass is half of that of earth and radius the same. Same experiment is repeated and corresponding times noted as t' and T' , then
 (1) $t' = \sqrt{2}T'$ (2) $t' > 2T'$
 (3) $t' < 2T'$ (4) $t' = 2T'$
- A tuning fork with frequency 800 Hz produces resonance in a resonance column tube with upper end open and lower end closed by water surface. Successive resonance are observed at length 9.75 cm, 31.25 cm and 52.75 cm. The speed of sound in air is :-
 (1) 500 m/s
 (2) 156 m/s
 (3) 344 m/s
 (4) 172 m/s
- An object flying in air with velocity $(20\hat{i} + 25\hat{j} - 12\hat{k})$ suddenly breaks in two pieces whose masses are in the ratio 1 : 5. The smaller mass flies off with a velocity $(100\hat{i} + 35\hat{j} + 8\hat{k})$. The velocity of the larger piece will be :-
 (1) $4\hat{i} + 23\hat{j} - 16\hat{k}$ (2) $-100\hat{i} - 35\hat{j} - 8\hat{k}$
 (3) $20\hat{i} + 15\hat{j} - 80\hat{k}$ (4) $-20\hat{i} - 15\hat{j} - 80\hat{k}$
- An object kept in a large room having air temperature of 25°C takes 12 minutes to cool from 80°C to 70°C . The time taken to cool for the same object from 70°C to 60°C would be nearly :-
 (1) 10 min (2) 12 min
 (3) 20 min (4) 15 min
- Two small spherical metal balls, having equal masses, are made from materials of densities ρ_1 and ρ_2 ($\rho_1 = 8\rho_2$) and have radii of 1mm and 2mm, respectively. They are made to fall vertically (from rest) in a viscous medium whose coefficient of viscosity equals η and whose density is $0.1 \rho_2$. The ratio of their terminal velocities would be :-
 (1) $\frac{79}{72}$ (2) $\frac{19}{36}$ (3) $\frac{39}{72}$ (4) $\frac{79}{36}$
- A particle starting from rest, moves in a circle of radius ' r '. It attains a velocity of V_0 m/s in the n^{th} round. Its angular acceleration will be :-
 (1) $\frac{V_0}{n} \text{ rad/s}^2$ (2) $\frac{V_0^2}{2\pi nr^2} \text{ rad/s}^2$
 (3) $\frac{V_0^2}{4\pi nr^2} \text{ rad/s}^2$ (4) $\frac{V_0^2}{4\pi nr} \text{ rad/s}^2$
- A person standing on the floor of an elevator drops a coin. The coin reaches the floor in time t_1 if the elevator is at rest and in time t_2 if the elevator is moving uniformly. Then :-
 (1) $t_1 < t_2$ or $t_1 > t_2$ depending upon whether the lift is going up or down
 (2) $t_1 < t_2$
 (3) $t_1 > t_2$
 (4) $t_1 = t_2$

10. A truck is stationary and has a bob suspended by a light string, in a frame attached to the truck. The truck, suddenly moves to the right with an acceleration of a . The pendulum will tilt :-

- (1) to the left and angle of inclination of the pendulum with the vertical is $\sin^{-1}\left(\frac{g}{a}\right)$
- (2) to the left and angle of inclination of the pendulum with the vertical is $\tan^{-1}\left(\frac{a}{g}\right)$
- (3) to the left and angle of inclination of the pendulum with the vertical is $\sin^{-1}\left(\frac{a}{g}\right)$
- (4) to the left and angle of inclination of the pendulum with the vertical is $\tan^{-1}\left(\frac{g}{a}\right)$

11. In a U-tube as shown in figure, water and oil are in the left side and right side of the tube respectively. The heights from the bottom for water and oil columns are 15 cm and 20 cm respectively. The density of the oil is :-
[take $\rho_{\text{water}} = 1000 \text{ kg/m}^3$]

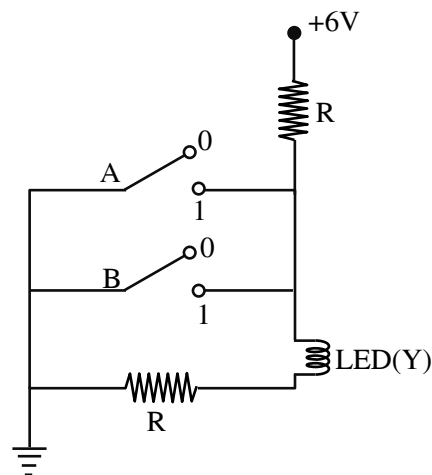


- (1) 1200 kg/m^3
 - (2) 750 kg/m^3
 - (3) 1000 kg/m^3
 - (4) 1333 kg/m^3
12. A deep rectangular pond of surface area A , containing water (density $= \rho$, specific heat capacity $= s$), is located in a region where the outside air temperature is at a steady value of -26°C . The thickness of the frozen ice layer in this pond, at a certain instant is x . Taking the thermal conductivity of ice as K , and its specific latent heat of fusion as L , the rate of increase of the thickness of ice layer, at this instant would be given by :-
- (1) $26K/\rho r(L-4s)$
 - (2) $26K/(\rho x^2 - L)$
 - (3) $26K/(\rho x L)$
 - (4) $26K/\rho r(L+4s)$

13. An LED is constructed from a p-n junction diode using GaAsP. The energy gap is 1.9 eV . The wavelength of the light emitted will be equal to :-

- (1) $10.4 \times 10^{-26} \text{ m}$
- (2) 654 nm
- (3) 654 \AA
- (4) $654 \times 10^{-11} \text{ m}$

14. The circuit diagram shown here corresponds to the logic gate,



- (1) NOR
- (2) AND
- (3) OR
- (4) NAND

15. The value of $\gamma \left(= \frac{C_p}{C_v} \right)$, for hydrogen, helium and another ideal diatomic gas X (whose molecules are not rigid but have an additional vibrational mode), are respectively equal to :-

- (1) $\frac{7}{5}, \frac{5}{3}, \frac{9}{7}$
- (2) $\frac{5}{3}, \frac{7}{5}, \frac{9}{7}$
- (3) $\frac{5}{3}, \frac{7}{5}, \frac{7}{5}$
- (4) $\frac{7}{5}, \frac{5}{3}, \frac{7}{5}$

16. An equiconvex lens has power P . It is cut into two symmetrical halves by a plane containing the principal axis. The power of one part will be :

- (1) 0
- (2) $\frac{P}{2}$
- (3) $\frac{P}{4}$
- (4) P

17. In a Young's double slit experiment if there is no initial phase difference between the light from the two slits, a point on the screen corresponding to the fifth minimum has path difference.

- (1) $5 \frac{\lambda}{2}$
- (2) $10 \frac{\lambda}{2}$
- (3) $9 \frac{\lambda}{2}$
- (4) $11 \frac{\lambda}{2}$

18. A double convex lens has focal length 25 cm. The radius of curvature of one of the surfaces is double of the other. Find the radii if the refractive index of the material of the lens is 1.5 :

(1) 100 cm, 50 cm
(2) 25 cm, 50 cm
(3) 18.75 cm, 37.5 cm
(4) 50 cm, 100 cm

19. Two bullets are fired horizontally and simultaneously towards each other from roof tops of two buildings 100 m apart and of same height of 200m with the same velocity of 25 m/s. When and where will the two bullets collide. ($g = 10 \text{ m/s}^2$)

(1) after 2s at a height 180 m
(2) after 2s at a height of 20 m
(3) after 4s at a height of 120 m
(4) they will not collide

20. The stress-strain curves are drawn for two different materials X and Y. It is observed that the ultimate strength point and the fracture point are close to each other for material X but are far apart for material Y. We can say that materials X and Y are likely to be (respectively)

(1) ductile and brittle
(2) brittle and ductile
(3) brittle and plastic
(4) plastic and ductile

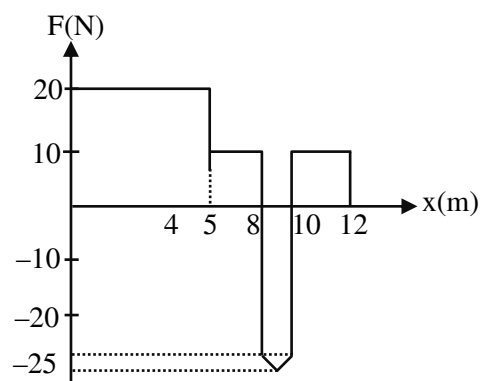
21. A body of mass m is kept on a rough horizontal surface (coefficient of friction = μ) A horizontal force is applied on the body, but it does not move. The resultant of normal reaction and the frictional force acting on the object is given by F , where F is :

(1) $|\vec{F}| = mg + \mu mg$
(2) $|\vec{F}| = \mu mg$
(3) $|\vec{F}| \leq mg\sqrt{1 + \mu^2}$
(4) $|\vec{F}| = mg$

22. A particle of mass 5 m at rest suddenly breaks on its own into three fragments. Two fragments of mass m each move along mutually perpendicular direction with speed v each. The energy released during the process is :

(1) $\frac{3}{5}mv^2$ (2) $\frac{5}{3}mv^2$
(3) $\frac{3}{2}mv^2$ (4) $\frac{4}{3}mv^2$

23. An object of mass 500g, initially at rest acted upon by a variable force, whose X component varies with x in the manner shown. The velocities of the object at point $X = 8 \text{ m}$ and $X = 12 \text{ m}$, would be the respective values of (nearly)



(1) 18 m/s and 24.4 m/s
(2) 23 m/s and 24.4 m/s
(3) 23 m/s and 20.6 m/s
(4) 18 m/s and 20.6 m/s

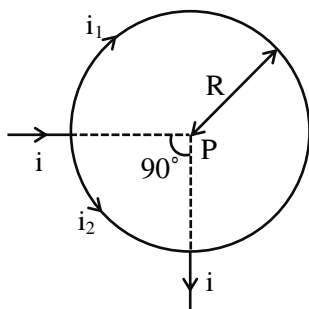
24. A solid cylinder of mass 2 kg and radius 50 cm rolls up an inclined plane of angle inclination 30° . The centre of mass of cylinder has speed of 4 m/s. The distance travelled by the cylinder on the incline surface will be : (Take $g = 10 \text{ m/s}^2$)

(1) 2.2 m (2) 1.6 m
(3) 1.2 m (4) 2.4 m

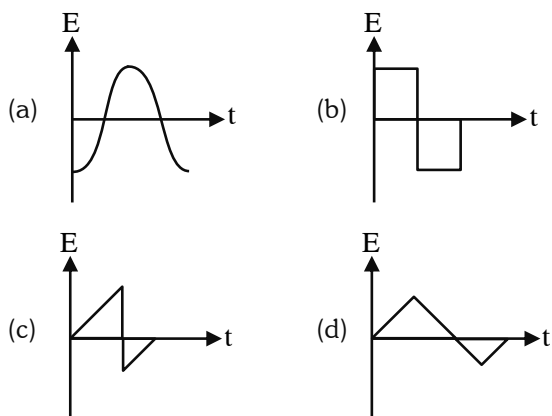
25. Two toroids 1 and 2 have total number of turns 200 and 100 respectively with average radii 40 cm and 20 cm respectively. If they carry same current i , then the ratio of the magnetic fields along the two is :

(1) 1 : 1 (2) 4 : 1
(3) 2 : 1 (4) 1 : 2

26. A straight conductor carrying current i splits into two parts as shown in the figure. The radius of the circular loop is R . The total magnetic field at the centre P of the loop is :



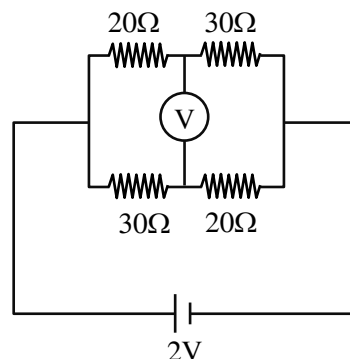
- (1) Zero
(2) $3\mu_0 i / 32 R$, outward
(3) $3\mu_0 i / 32 R$, inward
(4) $\mu_0 i / 2R$, inward
27. The variation of EMF with time for four types of generators are shown in the figures. Which amongst them can be called AC ?



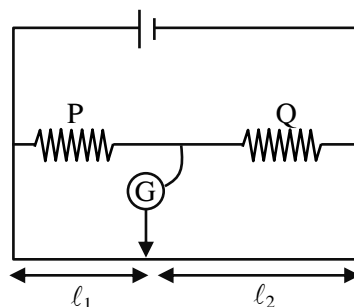
- (1) (a) and (d) (2) (a), (b), (c) and (d)
(3) (a) and (b) (4) only (a)
28. The radius of the first permitted Bohr orbit for the electron, in a hydrogen atom equals 0.51 \AA and its ground state energy equals -13.6 eV . If the electron in the hydrogen atom is replaced by muon (μ^-) [charge same as electron and mass $207 m_e$], the first Bohr radius and ground state energy will be :

- (1) $0.53 \times 10^{-13} \text{ m}$, -3.6 eV
(2) $25.6 \times 10^{-13} \text{ m}$, -2.8 eV
(3) $2.56 \times 10^{-13} \text{ m}$, -2.8 eV
(4) $2.56 \times 10^{-13} \text{ m}$, -13.6 eV

29. The reading of an ideal voltmeter in the circuit shown is :



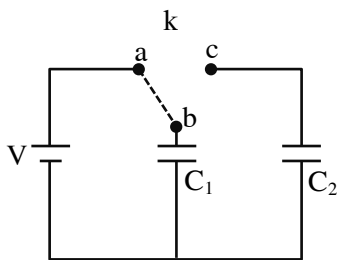
- (1) 0.6 V (2) 0 V
(3) 0.5 V (4) 0.4 V
30. The metre bridge shown is in balanced position with $\frac{P}{Q} = \frac{\ell_1}{\ell_2}$. If we now interchange the positions of galvanometer and cell, will the bridge work ? If yes, what will be balance condition ?



- (1) yes, $\frac{P}{Q} = \frac{\ell_2 - \ell_1}{\ell_2 + \ell_1}$ (2) no, no null point
(3) yes, $\frac{P}{Q} = \frac{\ell_2}{\ell_1}$ (4) yes, $\frac{P}{Q} = \frac{\ell_1}{\ell_2}$
31. The relations amongst the three elements earth's magnetic field, namely horizontal component H , vertical component V and dip δ are, (B_E = total magnetic field)
- (1) $V = B_E \tan \delta$, $H = B_E$
(2) $V = B_E \sin \delta$, $H = B_E \cos \delta$
(3) $V = B_E \cos \delta$, $H = B_E \sin \delta$
(4) $V = B_E$, $H = B_E \tan \delta$
32. The rate of radioactive disintegration at an instant for a radioactive sample of half life $2.2 \times 10^9 \text{ s}$ is 10^{10} s^{-1} . The number of radioactive atoms in that sample at that instant is,
- (1) 3.17×10^{20} (2) 3.17×10^{17}
(3) 3.17×10^{18} (4) 3.17×10^{19}
33. The time period of a geostationary satellite is 24 h , at a height $6R_E$ (R_E is radius of earth) from surface of earth. The time period of another satellite whose height is $2.5 R_E$ from surface will be,

- (1) $6\sqrt{2} \text{ h}$ (2) $12\sqrt{2} \text{ h}$
(3) $\frac{24}{2.5} \text{ h}$ (4) $\frac{12}{2.5} \text{ h}$

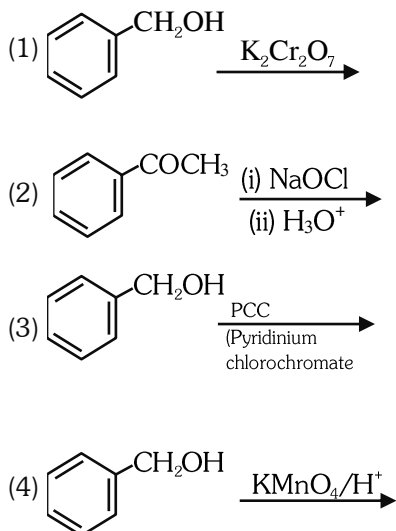
34. A circuit when connected to an AC source of 12 V gives a current of 0.2 A. The same circuit when connected to a DC source of 12 V, gives a current of 0.4 A. The circuit is
 (1) series LR (2) series RC
 (3) series LC (4) series LCR
35. A cycle wheel of radius 0.5 m is rotated with constant angular velocity of 10 rad/s in a region of magnetic field of 0.1 T which is perpendicular to the plane of the wheel. The EMF generated between its centre and the rim is,
 (1) 0.25 V (2) 0.125 V
 (3) 0.5 V (4) zero
36. For a transparent medium relative permeability and permittivity, μ_r and ϵ_r are 1.0 and 1.44 respectively. The velocity of light in this medium would be,
 (1) 2.5×10^8 m/s (2) 3×10^8 m/s
 (3) 2.08×10^8 m/s (4) 4.32×10^8 m/s
37. A sphere encloses an electric dipole with charge $\pm 3 \times 10^{-6}$ C. What is the total electric flux across the sphere?
 (1) -3×10^{-6} Nm²/C (2) zero
 (3) 3×10^{-6} Nm²/C (4) 6×10^{-6} Nm²/C
38. Two identical capacitors C_1 and C_2 of equal capacitance are connected as shown in the circuit. Terminals a and b of the key k are connected to charge capacitor C_1 using battery of emf V volt. Now disconnecting a and b the terminals b and c are connected. Due to this, what will be the percentage loss of energy?



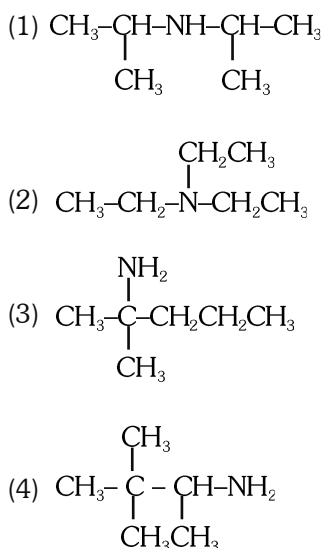
- (1) 75% (2) 0% (3) 50% (4) 25%
39. The main scale of a vernier calliper has n divisions/cm. n divisions of the vernier scale coincide with $(n - 1)$ divisions of main scale. The least count of the vernier calliper is,
 (1) $\frac{1}{(n+1)(n-1)}$ cm (2) $\frac{1}{n}$ cm
 (3) $\frac{1}{n^2}$ cm (4) $\frac{1}{n(n+1)}$ cm

40. A person travelling in a straight line moves with a constant velocity v_1 for certain distance 'x' and with a constant velocity v_2 for next equal distance. The average velocity v is given by the relation
 (1) $\frac{1}{v} = \frac{1}{v_1} + \frac{1}{v_2}$ (2) $\frac{2}{v} = \frac{1}{v_1} + \frac{1}{v_2}$
 (3) $\frac{v}{2} = \frac{v_1 + v_2}{2}$ (4) $v = \sqrt{v_1 v_2}$
41. Assuming that the gravitational potential energy of an object at infinity is zero, the change in potential energy (final – initial) of an object of mass m , when taken to a height h from the surface of earth (of radius R), is given by,
 (1) $-\frac{GMm}{R+h}$ (2) $\frac{GMmh}{R(R+h)}$
 (3) mgh (4) $\frac{GMm}{R+h}$
42. 1g of water, of volume 1 cm³ at 100°C, is converted into steam at same temperature under normal atmospheric pressure ($\approx 1 \times 10^5$ Pa). The volume of steam formed equals 1671 cm³. If the specific latent heat of vaporisation of water is 2256 J/g, then the change in internal energy is,
 (1) 2423 J (2) 2089 J
 (3) 167 J (4) 2256 J
43. Angular width of the central maxima in the Fraunhofer diffraction for $\lambda = 6000 \text{ \AA}$ is θ_0 . When the same slit is illuminated by another monochromatic light, the angular width decreases by 30%. The wavelength of this light is,
 (1) 1800 Å (2) 4200 Å
 (3) 6000 Å (4) 420 Å
44. The work function of a photosensitive material is 4.0 eV. The longest wavelength of light that can cause photon emission from the substance is (approximately)
 (1) 3100 nm (2) 966 nm
 (3) 31 nm (4) 310 nm
45. A proton and an α -particle are accelerated from rest to the same energy. The de Broglie wavelengths λ_p and λ_α are in the ratio,
 (1) 2 : 1 (2) 1 : 1
 (3) $\sqrt{2}$: 1 (4) 4 : 1

46. The reaction that **does not** give benzoic acid as the major product is :-



47. The amine that reacts with Hinsberg's reagent to give an alkali insoluble product is :-



48. Which structure(s) of proteins remains(s) intact during denaturation process ?

- (1) Both secondary and tertiary structures
(2) Primary structure only
(3) Secondary structure only
(4) Tertiary structure only

49. The polymer that is used as a substitute for wool in making commercial fibres is :-

- (1) Melamine
(2) nylon-6, 6
(3) polyacrylonitrile
(4) Buna-N

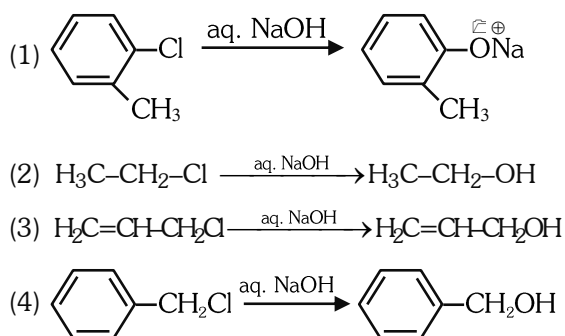
50. The artificial sweetener stable at cooking temperature and does not provide calories is :-

- (1) Saccharin (2) Aspartame
(3) Sucralose (4) Alitame

51. The liquified gas that is used in dry cleaning along with a suitable detergent is :-

- (1) Water gas (2) Petroleum gas
(3) NO₂ (4) CO₂

52. The hydrolysis reaction that takes place at the slowest rate, among the following is :-



53. When vapours of a secondary alcohol is passed over heated copper at 573 K, the product formed is :-

- (1) a carboxylic acid (2) an aldehyde
(3) a ketone (4) an alkene

54. The major products C and D formed in the following reactions respectively are :-



- (1) $\text{H}_3\text{C}-\text{CH}_2-\text{CH}_2-\text{I}$ and $\text{I}-\text{C}(\text{CH}_3)_3$
(2) $\text{H}_3\text{C}-\text{CH}_2-\text{CH}_2-\text{OH}$ and $\text{I}-\text{C}(\text{CH}_3)_3$
(3) $\text{H}_3\text{C}-\text{CH}_2-\text{CH}_2-\text{I}$ and $\text{HO}-\text{C}(\text{CH}_3)_3$
(4) $\text{H}_3\text{C}-\text{CH}_2-\text{CH}_2-\text{OH}$ and $\text{HO}-\text{C}(\text{CH}_3)_3$

55. Match the oxide given in column A with its property given in column B:

Column-A	Column-B
(i) Na ₂ O	(a) Neutral
(ii) Al ₂ O ₃	(b) Basic
(iii) N ₂ O	(c) Acidic
(iv) Cl ₂ O ₇	(d) Amphoteric

Which of the following options has all correct pairs?

- (1) (i)-(b), (ii)-(a), (iii)-(d), (iv)-(c)
(2) (i)-(c), (ii)-(b), (iii)-(a), (iv)-(d)
(3) (i)-(a), (ii)-(d), (iii)-(b), (iv)-(c)
(4) (i)-(b), (ii)-(d), (iii)-(a), (iv)-(c)

56. Match the catalyst with the process :-

Catalyst	Process
(i) V_2O_5	(a) The oxidation of ethyne to ethanal
(ii) $TiCl_4 + Al(CH_3)_3$	(b) Polymerisation of alkynes
(iii) $PdCl_2$	(c) Oxidation of SO_2 in the manufacture of H_2SO_4
(iv) Nickel complexes	(d) Polymerisation of ethylene

Which of the following is the correct option ?

- (1) i-c, ii-d, iii-a, iv-b (2) i-a, ii-b, iii-c, iv-d
(3) i-a, ii-c, iii-b, iv-d (4) i-c, ii-a, iii-d, iv-b

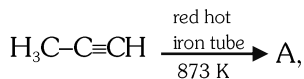
57. The most stable carbocation, among the following is :-

- (1) $(CH_3)_3C-\overset{\oplus}{CH}-CH_3$
(2) $CH_3-CH_2-\overset{\oplus}{CH}-CH_2-CH_3$
(3) $CH_3-\overset{\oplus}{CH}-CH_2-CH_2-CH_3$
(4) $CH_3-CH_2-\overset{\oplus}{CH_2}$

58. The alkane that gives only one mono-chloro product on chlorination with Cl_2 in presence of diffused sunlight is :-

- (1) 2,2-dimethylbutane (2) neopentane
(3) n-pentane (4) Isopentane

59. In the following reaction,



the number of sigma(σ) bonds present in the product A is :-

- (1) 21 (2) 9
(3) 24 (4) 18

60. Aluminium chloride in acidified aqueous solution forms a complex 'A', in which hybridisation state of Al is 'B'. What are 'A' and 'B', respectively ?

- (1) $[Al(H_2O)_6]^{3+}$, sp^3d^2 (2) $[Al(H_2O)_4]^{3+}$, sp^3
(3) $[Al(H_2O)_4]^{3+}$, dsp^2 (4) $[Al(H_2O)_6]^{3+}$, d^2sp^3

61. Which of the following compounds is used in cosmetic surgery?

- (1) Silica (2) Silicates
(3) Silicones (4) Zeolites

62. Identify the incorrect statement.

- (1) The scientific and technological process used for isolation of the metal from its ore is known as metallurgy
(2) Minerals are naturally occurring chemical substances in the earth's crust
(3) Ores are minerals that may contain a metal
(4) Gangue is an ore contaminated with undesired materials

63. A compound 'X' upon reaction with H_2O produces a colorless gas 'Y' with rotten fish smell. Gas 'Y' is absorbed in a solution of $CuSO_4$ to give Cu_3P_2 as one of the products. Predict the compound 'X'

- (1) Ca_3P_2 (2) NH_4Cl
(3) As_2O_3 (4) $Ca_3(PO_4)_2$

64. Which of the following oxoacids of phosphorus has strongest reducing property?

- (1) $H_4P_2O_7$ (2) H_3PO_3
(3) H_3PO_2 (4) H_3PO_4

65. Identify the correct formula of oleum from the following

- (1) $H_2S_2O_7$ (2) H_2SO_3
(3) H_2SO_4 (4) $H_2S_2O_8$

66. When neutral or faintly alkaline $KMnO_4$ is treated with potassium iodide, iodide ion is converted into 'X'. 'X' is-

- (1) I_2 (2) IO_4^-
(3) IO_3^- (4) IO^-

67. The Crystal Field Stabilisation Energy (CFSE) for $[CoCl_6]^{4-}$ is 18000 cm^{-1} . The CFSE for $[CoCl_4]^{2-}$ will be-

- (1) 6000 cm^{-1}
(2) 16000 cm^{-1}
(3) 18000 cm^{-1}
(4) 8000 cm^{-1}

- 68.** Following limiting molar conductivities are given as
 $\lambda_{m(H_2SO_4)}^0 = x \text{ S cm}^2 \text{ mol}^{-1}$
 $\lambda_{m(K_2SO_4)}^0 = y \text{ S cm}^2 \text{ mol}^{-1}$
 $\lambda_{m(CH_3COOK)}^0 = z \text{ S cm}^2 \text{ mol}^{-1}$
 λ_m^0 (in $\text{S cm}^2 \text{ mol}^{-1}$) for CH_3COOH will be-
 (1) $x - y + 2z$ (2) $x + y - z$
 (3) $x - y + z$ (4) $\frac{(x - y)}{2} + z$
- 69.** A first order reaction has a rate constant of $2.303 \times 10^{-3} \text{ s}^{-1}$. The time required for 40g of this reactant to reduce to 10 g will be-
 [Given that $\log_{10} 2 = 0.3010$]
 (1) 230.3 s (2) 301 s
 (3) 2000 s (4) 602 s
- 70.** For a reaction, activation energy $E_a = 0$ and the rate constant at 200K is $1.6 \times 10^6 \text{ s}^{-1}$. The rate constant at 400K will be-
 [Given that gas constant $R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$]
 (1) $3.2 \times 10^4 \text{ s}^{-1}$ (2) $1.6 \times 10^6 \text{ s}^{-1}$
 (3) $1.6 \times 10^3 \text{ s}^{-1}$ (4) $3.2 \times 10^6 \text{ s}^{-1}$
- 71.** The correct option representing a Freundlich adsorption isotherm is
 (1) $\frac{x}{m} = KP^{0.3}$ (2) $\frac{x}{m} = KP^{2.5}$
 (3) $\frac{x}{m} = KP^{-0.5}$ (4) $\frac{x}{m} = KP^{-1}$
- 72.** Which of the following is paramagnetic ?
 (1) N_2 (2) H_2
 (3) Li_2 (4) O_2
- 73.** Which of the following is the correct order of dipole moment ?
 (1) $\text{NH}_3 < \text{BF}_3 < \text{NF}_3 < \text{H}_2\text{O}$
 (2) $\text{BF}_3 < \text{NF}_3 < \text{NH}_3 < \text{H}_2\text{O}$
 (3) $\text{BF}_3 < \text{NH}_3 < \text{NF}_3 < \text{H}_2\text{O}$
 (4) $\text{H}_2\text{O} < \text{NF}_3 < \text{NH}_3 < \text{BF}_3$
- 74.** Crude sodium chloride obtained by crystallisation of brine solution does not contain
 (1) MgSO_4 (2) Na_2SO_4
 (3) MgCl_2 (4) CaSO_4
- 75.** Which of the alkali metal chloride (MCl) forms its dihydrate salt ($\text{MCl} \cdot 2\text{H}_2\text{O}$) easily ?
 (1) LiCl (2) CsCl
 (3) RbCl (4) KCl
- 76.** The pH of 0.01 M NaOH (aq) solution will be
 (1) 7.01 (2) 2
 (3) 12 (4) 9
- 77.** Which of the following cannot act both as Bronsted acid and as Bronsted base ?
 (1) HCO_3^- (2) NH_3
 (3) HCl (4) HSO_4^-
- 78.** The molar solubility of CaF_2 ($K_{sp} = 5.3 \times 10^{-11}$) in 0.1 M solution of NaF will be
 (1) $5.3 \times 10^{-11} \text{ mol L}^{-1}$
 (2) $5.3 \times 10^{-8} \text{ mol L}^{-1}$
 (3) $5.3 \times 10^{-9} \text{ mol L}^{-1}$
 (4) $5.3 \times 10^{-10} \text{ mol L}^{-1}$
- 79.** The oxidation state of Cr in CrO_6 is :
 (1) -6 (2) +12
 (3) +6 (4) +4
- 80.** The number of hydrogen bonded water molecule(s) associated with $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ is :-
 (1) 3 (2) 1
 (3) 2 (4) 5
- 81.** Formula of nickel oxide with metal deficiency defect in its crystal is $\text{Ni}_{0.98}\text{O}$. The crystal contains Ni^{2+} and Ni^{3+} ions. The fraction of nickel existing as Ni^{2+} ions in the crystal is
 (1) 0.96
 (2) 0.04
 (3) 0.50
 (4) 0.31

82. Which of the following statements is correct regarding a solution of two compounds A and B exhibiting positive deviation from ideal behaviour?
- Intermolecular attractive forces between A-A and B-B are stronger than those between A-B.
 - $\Delta_{\text{mix}} H = 0$ at constant T and P
 - $\Delta_{\text{mix}} V = 0$ at constant T and P
 - Intermolecular attractive forces between A-A and B-B are equal to those between A-B.
83. In water saturated air the mole fraction of water vapour is 0.02. If the total pressure of the saturated air is 1.2 atm, the partial pressure of dry air is :
- 1.18 atm
 - 1.76 atm
 - 1.176 atm
 - 0.98 atm
84. The standard electrode potential (E°) values of Al^{3+}/Al , Ag^+/Ag , K^+/K and Cr^{3+}/Cr are -1.66 V, 0.80 V, -2.93 V and -0.74 V, respectively. The correct decreasing order of reducing power of the metal is :
- $\text{Ag} > \text{Cr} > \text{Al} > \text{K}$
 - $\text{K} > \text{Al} > \text{Cr} > \text{Ag}$
 - $\text{K} > \text{Al} > \text{Ag} > \text{Cr}$
 - $\text{Al} > \text{K} > \text{Ag} > \text{Cr}$
85. The density of 2 M aqueous solution of NaOH is 1.28 g/cm^3 . The molality of the solution is [Given that molecular mass of NaOH = 40 g mol^{-1}]
- 1.20 m
 - 1.56 m
 - 1.67 m
 - 1.32 m
86. Orbital having 3 angular nodes and 3 total nodes is :-
- 5 p
 - 3 d
 - 4 f
 - 6 d
87. In hydrogen atom, the de Broglie wavelength of an electron in the second Bohr orbit is :- [Given that Bohr radius, $a_0 = 52.9 \text{ pm}$]
- 211.6 pm
 - $211.6 \pi \text{ pm}$
 - $52.9 \pi \text{ pm}$
 - 105.8 pm
88. The volume occupied by 1.8 g of water vapour at 374°C and 1 bar pressure will be :- [Use $R = 0.083 \text{ bar L K}^{-1}\text{mol}^{-1}$]
- 96.66 L
 - 55.87 L
 - 3.10 L
 - 5.37 L
89. An ideal gas expands isothermally from 10^{-3} m^3 to 10^{-2} m^3 at 300 K against a constant pressure of 10^5 Nm^{-2} . The work in the process is :-
- +270 kJ
 - 900 J
 - +900 kJ
 - 900 kJ
90. Reversible expansion of an ideal gas under isothermal and adiabatic conditions are as shown in the figure.
-
- AB \rightarrow Isothermal expansion
AC \rightarrow Adiabatic expansion
- Which of the following options is **not** correct ?
- $\Delta S_{\text{isothermal}} > \Delta S_{\text{adiabatic}}$
 - $T_A = T_B$
 - $W_{\text{isothermal}} > W_{\text{adiabatic}}$
 - $T_C > T_A$

91. Which of the following cell organelles is present in the highest number in secretory cells ?
 (1) Mitochondria
 (2) Golgi complex
 (3) Endoplasmic reticulum
 (4) Lysosomes
92. Non-membranous nucleoplasmic structures in nucleus are the site for active synthesis of :-
 (1) Protein synthesis (2) mRNA
 (3) rRNA (4) tRNA
93. Which of the following nucleic acids is present in an organism having 70S ribosomes only ?
 (1) Single stranded DNA with protein coat
 (2) Double stranded circular naked DNA
 (3) Double stranded DNA enclosed in nuclear membrane
 (4) Double stranded circular DNA with histone proteins
94. After meiosis-I, the resultant daughter cells have:-
 (1) Same amount of DNA as in the parent cell in S phase
 (2) Twice the amount of DNA in comparison to haploid gamete.
 (3) Same amount of DNA in comparison to haploid gamete
 (4) Four times the amount of DNA in comparison to haploid gamete
95. Which of the following organic compounds is the main constituent of Lecithin ?
 (1) Arachidonic acid (2) Phospholipid
 (3) Cholesterol (4) Phosphoprotein
96. The main difference between active and passive transport across cell membrane is :-
 (1) Passive transport is non-selective whereas active transport is selective
 (2) Passive transport requires a concentration gradient across a biological membrane whereas active transport requires energy to move solutes
 (3) Passive transport is confined to anionic carrier proteins whereas active transport is confined to cationic channel proteins
 (4) Active transport occurs more rapidly than passive transport
97. Match the items given in column I with those in column II and choose the correct option :

Column-I	Column-II
(a) Rennin	(i) Vitamin B ₁₂
(b) Enterokinase	(ii) Facilitated transport
(c) Oxyntic cells	(iii) Milk proteins
(d) Fructose	(iv) Trypsinogen
(1) a-iii, b-iv, c-ii, d-i	(2) a-iv, b-iii, c-i, d-ii
(3) a-iv, b-iii, c-ii, d-i	(4) a-iii, b-iv, c-i, d-ii
98. Kwashiorkor disease is due to :-
 (1) Simultaneous deficiency of proteins and fats
 (2) Simultaneous deficiency of proteins and calories
 (3) Deficiency of carbohydrates
 (4) Protein deficiency not accompanied by calorie deficiency
99. Select the correct sequence of events :
 (1) Gametogenesis → Gamete transfer → Syngamy → Zygote → Cell division (Cleavage) → Cell differentiation → Organogenesis
 (2) Gametogenesis → Gamete transfer → Syngamy → Zygote → Cell division (Cleavage) → Organogenesis → Cell differentiation
 (3) Gametogenesis → Syngamy → Gamete transfer → Zygote → Cell division (Cleavage) → Cell differentiation → Organogenesis
 (4) Gametogenesis → Gamete transfer → Syngamy → Zygote → Cell differentiation → Cell division (Cleavage) → Organogenesis
100. Which of the following hormones is responsible for both the milk ejection reflex and the foetal ejection reflex ?
 (1) Estrogen (2) Prolactin
 (3) Oxytocin (4) Relaxin
101. No new follicles develop in the luteal phase of the menstrual cycle because
 (1) Follicles do not remain in the ovary after ovulation
 (2) FSH levels are high in the luteal phase
 (3) LH levels are high in the luteal phase
 (4) Both FSH and LH levels are low in the luteal phase
102. In Australia, marsupials and placental mammals have evolved to share many similar characteristics. This type of evolution may be referred to as :
 (1) Adaptive Radiation
 (2) Divergent Evolution
 (3) Cyclical Evolution
 (4) Convergent Evolution

103. Match the items of column I with column II

Column I Column II

- | | |
|---------------------------------------|---------------------------|
| (a) XX-XO method of sex determination | (i) Turner's syndrome |
| (b) XX-XY method of sex determination | (ii) Female heterogametic |
| (c) Karyotype-45 | (iii) Grasshopper |
| (d) ZW-ZZ method of sex determination | (iv) Female homogametic |

Select the correct option from the following :

- | | |
|----------------------------|----------------------------|
| (1) a-ii, b-iv, c-i, d-iii | (2) a-i, b-iv, c-ii, d-iii |
| (3) a-iii, b-iv, c-i, d-ii | (4) a-iv, b-ii, c-i, d-iii |

104. What will be the sequence of mRNA produced by the following stretch of DNA ?

3'ATGCATGCATGCATG5' TEMPLATE STRAND
5' TACGTACGTACGTAC3' CODING STRAND

- (1) 3'AUGCAUGCAUGCAUG5'
- (2) 5'UACGUACGUACGUAC 3'
- (3) 3' UACGUACGUACGUAC 5'
- (4) 5' AUGCAUGCAUGCAUG 3'

105. Select the **incorrect** statement regarding inbreeding

- (1) Inbreeding helps in elimination of deleterious alleles from the population
- (2) Inbreeding is necessary to evolve a pureline in any animal
- (3) Continued inbreeding reduces fertility and leads to inbreeding depression
- (4) Inbreeding depression can not be overcome by out-crossing

106. A biocontrol agent to be a part of an integrated pest management should be

- (1) Species-specific and symbiotic
- (2) Free living and broad spectrum
- (3) Narrow spectrum and symbiotic
- (4) Species-specific and inactive on non-target organisms

107. Match the following enzymes with their functions:

- | | |
|------------------------------|---|
| (a) Restriction endonuclease | (i) Joins the DNA fragments |
| (b) Restriction exonuclease | (ii) Extends primers on genomic DNA template |
| (c) DNA ligase | (iii) Cuts DNA at specific position |
| (d) Taq polymerase | (iv) Removes nucleotides from the ends of DNA |

Select the correct option from the following :

- | | |
|----------------------------|----------------------------|
| (1) a-iii, b-i, c-iv d-ii | (2) a-iii, b-iv, c-i, d-ii |
| (3) a-iv, b-iii, c-i, d-ii | (4) a-ii, b-iv, c-i, d-iii |

108. The two antibiotic resistance genes on vector pBR322 are :-

- (1) Ampicillin and Tetracycline
- (2) Ampicillin and Chloramphenicol
- (3) Chloramphenicol and Tetracycline
- (4) Tetracycline and Kanamycin

109. Exploitation of bioresources of a nation by multinational companies without authorization from the concerned country is referred to as-

- | | |
|---------------|---------------|
| (1) Bioweapon | (2) Biopiracy |
| (3) Bioethics | (4) Biowar |

110. Carnivorous animals - lions and leopards, occupy the same niche but lions predate mostly larger animals and leopards take smaller ones. This mechanism of competition is referred to as :-

- (1) Character displacement
- (2) Altruism
- (3) Resource partitioning
- (4) Competitive exclusion

111. Decline in the population of indian native fishes due to introduction of *Clarias gariepinus* in river Yamuna can be categorised as :-

- (1) Co-extinction
- (2) Habitat fragmentation
- (3) Over exploitation
- (4) Alien species invasion

112. Match the following RNA polymerase with their transcribed products :

- | | |
|------------------------|-------------|
| (a) RNA polymerase I | (i) tRNA |
| (b) RNA polymerase II | (ii) rRNA |
| (c) RNA polymerase III | (iii) hnRNA |

Select the correct option from the following :

- | | |
|----------------------|----------------------|
| (1) a-i, b-iii, c-ii | (2) a-i, b-ii, c-iii |
| (3) a-ii, b-iii, c-i | (4) a-iii, b-ii, c-i |

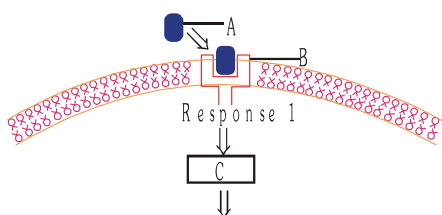
113. In a marriage between male with blood group A and female with blood group B, the progeny had either blood group AB or B. What could be the possible genotype of parents ?

- (1) $I^A i$ (Male) : $I^B I^B$ (Female)
- (2) $I^A I^A$ (Male) : $I^B I^B$ (Female)
- (3) $I^A I^A$ (Male) : $I^B i$ (Female)
- (4) $I^A i$ (Male) : $I^B i$ (Female)

114. A population of a species invades a new area. Which of the following condition will lead to Adaptive Radiation ?

- (1) Area with large number of habitats having very low food supply
- (2) Area with a single type of vacant habitat
- (3) Area with many types of vacant habitats
- (4) Area with many habitats occupied by a large number of species

115. Identify A, B and C in the diagrammatic representation of the mechanism of hormone action.



Select the correct option from the following :

- (1) A-Steroid Hormone; B-Hormone-receptor Complex, C-Protein
- (2) A-Protein Hormone, B-Receptor; C-Cyclic AMP
- (3) A-Steroid Hormone; B-Receptor, C - Second Messenger
- (4) A-Protein Hormone; B-Cyclic AMP, C-Hormone-receptor Complex

116. Humans have acquired immune system that produces antibodies to neutralize pathogens. Still innate immune system is present at the time of birth because it

- (1) is very specific and uses different macrophages.
- (2) produces memory cells for mounting fast secondary response.
- (3) has natural killer cells which can phagocytose and destroy microbes.
- (4) provides passive immunity.

117. Which of the following statements is **not** correct?

- (1) An action potential in an axon does not move backward because the segment behind is in a refractory phase
- (2) Depolarisation of hair cells of cochlea results in the opening of the mechanically gated potassium -ion channels.
- (3) Rods are very sensitive and contribute to daylight vision.
- (4) In the knee-jerk reflex, stimulus is the stretching of muscle and response is its contraction.

118. Match the following joints with the bones involved:

- | | |
|-------------------|--|
| (a) Gliding joint | (i) Between carpal and metacarpal of thumb |
| (b) Hinge joint | (ii) Between Atlas and Axis |
| (c) Pivot joint | (iii) Between the carpals |
| (d) Saddle joint | (iv) Between Humerus and Ulna. |

Select the correct option from the following:

- (1) (a)-(iii), (b)-(iv), (c)-(ii), d-(i)
- (2) (a)-(iv), (b)-(i), (c)-(ii), d-(iii)
- (3) (a)-(iv), (b)-(ii), (c)-(iii), d-(i)
- (4) (a)-(i), (b)-(iii), (c)-(ii), d-(iv)

119. Which of the following diseases is an autoimmune disorder?

- | | |
|-----------------------|---------------|
| (1) Myasthenia gravis | (2) Arthritis |
| (3) Osteoporosis | (4) Gout |

120. Artificial light, extended work-time and reduced sleep-time disrupt the activity of

- (1) Thymus gland
- (2) Pineal gland
- (3) Adrenal gland
- (4) Posterior pituitary gland

121. Which of the following conditions will stimulate parathyroid gland to release parathyroid hormone?

- (1) Fall in active Vitamin D levels
- (2) Fall in blood Ca^{+2} levels
- (3) Fall in bone Ca^{+2} levels
- (4) Rise in blood Ca^{+2} levels

122. Which of the following is a correct statement?

- (1) IUDs once inserted need not be replaced.
- (2) IUDs are generally inserted by the user herself
- (3) IUDs increase phagocytosis of sperms in the uterus.
- (4) IUDs suppress gametogenesis.

123. Which of the following sexually transmitted diseases do not specifically affect reproductive organs?

- (1) Genital warts and Hepatitis-B
- (2) Syphilis and Genital herpes
- (3) AIDS and Hepatitis B
- (4) Chlamydiasis and AIDS

124. Match the following genera with their respective phylum:

- | | |
|---------------------|----------------------|
| (a) <i>Ophura</i> | (i) Mollusca |
| (b) <i>Physalia</i> | (ii) Platyhelminthes |
| (c) <i>Pinctada</i> | (iii) Echinodermata |
| (d) <i>Planaria</i> | (iv) Coelenterata |

Select the correct option:

- (1) (a)-(iv), (b)-(i), (c)-(iii), d-(ii)
- (2) (a)-(iii), (b)-(iv), (c)-(i), d-(ii)
- (3) (a)-(i), (b)-(iii), (c)-(iv), d-(ii)
- (4) (a)-(iii), (b)-(iv), (c)-(ii), d-(i)

125. Which of the following animals are true coelomates with bilateral symmetry?

- (1) Adult Echinoderms
- (2) Aschelminthes
- (3) Platyhelminthes
- (4) Annelids

126. The contrasting characteristics generally in a pair used for identification of animals in Taxonomic Key are referred to as :

- | | |
|-------------|---------------|
| (1) Lead | (2) Couplet |
| (3) Doublet | (4) Alternate |

127. Match the following cell structure with its characteristic feature:

- | | |
|------------------------|---|
| (a) Tight junctions | (i) Cement neighbouring cells together to form sheet |
| (b) Adhering Junctions | (ii) Transmit information through chemical to another cells |
| (c) Gap junctions | (iii) Establish a barrier to prevent leakage of fluid across epithelial cells |
| (d) Synaptic junctions | (iv) Cytoplasmic channels to facilitate communication between adjacent cells |

Select correct option from the following

- (1) (a)-(ii), (b)-(iv), (c)-(i), d-(iii)
- (2) (a)-(iv), (b)-(ii), (c)-(i), d-(iii)
- (3) (a)-(iii), (b)-(i), (c)-(iv), d-(ii)
- (4) (a)-(iv), (b)-(iii), (c)-(i), d-(ii)

128. Which of the following statements is INCORRECT?

- (1) Cockroaches exhibit mosaic vision with less sensitivity and more resolution.
- (2) A mushroom-shaped gland is present in the 6th-7th abdominal segments of male cockroach.
- (3) A pair of spermatheca is present in the 6th segment of female cockroach.
- (4) Female cockroach possesses sixteen ovarioles in the ovaries.

129. Select the correct statement.

- (1) Expiration occurs due to external intercostal muscles
- (2) Intrapulmonary pressure is lower than the atmospheric pressure during inspiration.
- (3) Inspiration occurs when atmospheric pressure is less than intrapulmonary pressure.
- (4) Expiration is initiated due to contraction of diaphragm.

130. The maximum volume of air a person can breathe in after a forced expiration is known as :

- (1) Expiratory Capacity
- (2) Vital Capacity
- (3) Inspiratory Capacity
- (4) Total lung Capacity

131. All the components of the nodal tissue are autoexcitable. Why does the SA node act as the normal pacemaker?

- (1) SA node has the lowest rate of depolarisation.
- (2) SA node is the only component to generate the threshold potential.
- (3) Only SA node can convey the action potential to the other components.
- (4) SA node has the highest rate of depolarisation.

132. A specialised nodal tissue embedded in the lower corner of the right atrium, close to Atrio-ventricular septum, delays the spreading of impulses to heart apex for about 0.1 sec. The delay allows.

- (1) blood to enter aorta.
- (2) the ventricles to empty completely.
- (3) blood to enter pulmonary arteries.
- (4) the atria to empty completely.

133. Match the following parts of a nephron with their function:

- | | |
|-------------------------------------|--|
| (a) Descending limb of Henle's loop | (i) Reabsorption of salts only |
| (b) Proximal Convoluted tubule | (ii) Reabsorption of water only |
| (c) Ascending limb of Henle's loop | (iii) Conditional reabsorption of sodium ion & water |
| (d) Distal convoluted tubule | (iv) Reabsorption of ion, water and organic nutrients. |

Select the correct option from the following :

- (1) (a)-(i), (b)-(iii), (c)-(ii), d-(iv)
- (2) (a)-(ii), (b)-(iv), (c)-(i), d-(iii)
- (3) (a)-(i), (b)-(iv), (c)-(ii), d-(iii)
- (4) (a)-(iv), (b)-(i), (c)-(iii), d-(ii)

134. Match the items in Column-I with those in Column-II:

- | Column-I | Column-II |
|--------------------|---------------------------|
| (a) Podocytes | (i) Crystallised oxalates |
| (b) Protonephridia | (ii) Annelids |
| (c) Nephridia | (iii) Amphioxus |
| (d) Renal calculi | (iv) Filtration slits |

Select the correct option from the following :

- (1) (a)-(iii), (b)-(iv), (c)-(ii), d-(i)
- (2) (a)-(iii), (b)-(ii), (c)-(iv), d-(i)
- (3) (a)-(iv), (b)-(iii), (c)-(ii), d-(i)
- (4) (a)-(iv), (b)-(ii), (c)-(iii), d-(i)

135. Which of the following receptors are specifically responsible for maintenance of balance of body and posture?

- (1) Basilar membrane and otoliths
- (2) Hair cells and organ of corti
- (3) Tectorial membrane and macula
- (4) Crista ampullaris and macula

136. Which of the following is against the rules of ICBN?

- (1) Hand written scientific names should be underlined.
- (2) Every species should have a generic name and a specific epithet.
- (3) Scientific names are in Latin and should be italicized.
- (4) Generic and specific names should be written starting with small letters.

137. Mad cow disease in cattle is caused by an organism which has :-

- (1) inert crystalline structure
- (2) abnormally folded protein
- (3) free RNA without protein coat
- (4) free DNA without protein coat

138. Which of the following statements is correct ?

- (1) Lichens do not grow in polluted areas.
- (2) Algal component of lichens is called mycobiont.
- (3) Fungal component of lichens is called phycobiont
- (4) Lichens are not good pollution indicators.

139. Match the organisms in column-I with habitats in column-II

Column-I	Column-II
(a) Halophiles	(i) Hot springs
(b) Thermoacidophiles	(ii) Aquatic environment
(c) Methanogens	(iii) Guts of ruminants
(d) Cyanobacteria	(iv) Salty area

Select the correct answer from the options given below :-

- (1) (a)-(iv), (b)-(i), (c)-(iii), (d)-(ii)
 (2) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)
 (3) (a)-(iii), (b)-(iv), (c)-(ii), (d)-(i)
 (4) (a)-(ii), (b)-(iv), (c)-(iii), (d)-(i)
140. In the dicot root the vascular cambium originates from :-
 (1) Tissue located below the phloem bundles and a portion of pericycle tissue above protoxylem.
 (2) Cortical region.
 (3) Parenchyma between endodermis and pericycle.
 (4) Intrafascicular and interfascicular tissue in a ring.
141. Which of the following shows whorled phyllotaxy ?
 (1) Mustard (2) China rose
 (3) *Alstonia* (4) *Calotropis*
142. Regeneration of damaged growing grass following grazing is largely due to :-
 (1) Lateral meristem (2) Apical meristem
 (3) Intercalary meristem (4) Secondary meristem
143. Bicarpellary ovary with obliquely placed septum is seen in :-
 (1) *Brassica* (2) *Aloe*
 (3) *Solanum* (4) *Sesbania*
144. Which is the most common type of embryo sac in angiosperms ?
 (1) Tetrasporic with one mitotic stage of divisions
 (2) Monosporic with three sequential mitotic divisions
 (3) Monosporic with two sequential mitotic divisions
 (4) Bisporic with two sequential mitotic divisions
145. From the following, identify the **correct combination** of salient features of Genetic Code :-
 (1) Universal, Non-ambiguous, Overlapping
 (2) Degenerate, Overlapping, Commaless
 (3) Universal, Ambiguous, Degenerate
 (4) Degenerate, Non-overlapping, Non-ambiguous
146. Which scientist experimentally proved that DNA is the sole genetic material in bacteriophage ?
 (1) Beadle and Tatum (2) Messelson and Stahl
 (3) Hershey and Chase (4) Jacob and Monod

147. In the process of transcription in Eukaryotes, the RNA polymerase I transcribes :-

- (1) mRNA with additional processing, capping and tailing
 (2) tRNA, 5 S rRNA and snRNAs
 (3) rRNAs–28 S, 18 S and 5.8 S
 (4) Precursor of mRNA, hnRNA

148. In which genetic condition, each cell in the affected person has three sex chromosomes XXY ?

- (1) Thalassemia (2) Klinefelter's Syndrome
 (3) Phenylketonuria (4) Turner's Syndrome

149. What initiation and termination factors are involved in transcription in Eukaryotes ?

- (1) σ and ρ , respectively
 (2) α and β , respectively
 (3) β and γ , respectively
 (4) α and σ , respectively

150. Which of the following statements is correct about the origin and evolution of men ?

- (1) Agriculture came around 50,000 years back.
 (2) The *Dryopithecus* and *Ramapithecus* primates existing 15 million years ago, walked like men.
 (3) *Homo habilis* probably ate meat.
 (4) Neanderthal men lived in Asia between 1,00,000 and 40,000 years back.

151. The production of gametes by the parents, the formation of zygotes, the F_1 and F_2 plants, can be understood using :-

- (1) Pie diagram (2) A pyramid diagram
 (3) Punnett square (4) Wenn diagram

152. Match the column-I with column-II :-

Column-I	Column-II
(a) Golgi apparatus	(i) Synthesis of protein
(b) Lysosomes	(ii) Trap waste and excretory products
(c) Vacuoles	(iii) Formation of glycoproteins and glycolipids
(d) Ribosomes	(iv) Digesting biomolecules

Choose the right match from options given below :-

- (1) (a)-(iii), (b)-(iv), (c)-(ii), (d)-(i)
 (2) (a)-(iv), (b)-(iii), (c)-(i), (d)-(ii)
 (3) (a)-(iii), (b)-(ii), (c)-(iv), (d)-(i)
 (4) (a)-(i), (b)-(ii), (c)-(iv), (d)-(iii)
153. Prosthetic groups differ from co-enzymes in that :-
 (1) they require metal ions for their activity.
 (2) they (prosthetic groups) are tightly bound to apoenzymes.
 (3) their association with apoenzymes is transient.
 (4) they can serve as co-factors in a number of enzyme-catalyzed reactions.

- 154.** Crossing over takes place between which chromatids and in which stage of the cell cycle ?
 (1) Non-sister chromatids of non-homologous chromosomes at Zygotene stage of prophase I.
 (2) Non-sister chromatids of homologous chromosomes at Pachytene stage of prophase I.
 (3) Non-sister chromatids of homologous chromosomes at Zygotene stage of prophase I.
 (4) Non-sister chromatids of non-homologous chromosomes at Pachytene stage of prophase I.
- 155.** "Ramachandran plot" is used to confirm the structure of :-
 (1) RNA (2) Proteins
 (3) Triacylglycerides (4) DNA
- 156.** Which of the following is not a feature of active transport of solutes in plants ?
 (1) Occurs against concentration gradient
 (2) Non-selective
 (3) Occurs through membranes
 (4) Requires ATP
- 157.** Which of the following bacteria reduce nitrate in soil into nitrogen ?
 (1) *Nitrobacter* (2) *Nitrococcus*
 (3) *Thiobacillus* (4) *Nitrosomonas*
- 158.** What will be the direction of flow of water when a plant cell is placed in a hypotonic solution ?
 (1) Water will flow in both directions
 (2) Water will flow out of the cell
 (3) Water will flow into the cell
 (4) No flow of water in any direction
- 159.** Where is respiratory electron transport system (ETS) located in plants ?
 (1) Mitochondrial matrix
 (2) Outer mitochondrial membrane
 (3) Inner mitochondrial membrane
 (4) Intermembrane space
- 160.** In Hatch and Slack pathway, the primary CO_2 acceptor is -
 (1) Oxaloacetic acid
 (2) Phosphoglyceric acid
 (3) Phosphoenol pyruvate
 (4) RubisCO
- 161.** Removal of shoot tips is a very useful technique to boost the production of tea-leaves. This is because:-
 (1) Gibberellins prevent bolting and are inactivated
 (2) Auxins prevent leaf drop at early stages
 (3) Effect of auxins is removed and growth of lateral buds is enhanced.
 (4) Gibberellins delay senescence of leaves.
- 162.** One scientist cultured *Cladophora* in a suspension of *Azotobacter* and illuminated the culture by splitting light through a prism. He observed that bacteria accumulated mainly in the region of:
 (1) Violet and green light
 (2) Indigo and green light
 (3) Orange and yellow light
 (4) Blue and red light
- 163.** In order to increase the yield of sugarcane crop, which of the following plant growth regulators should be sprayed?
 (1) Ethylene (2) Auxins
 (3) Gibberellins (4) Cytokinins
- 164.** What type of pollination takes place in *Vallisneria*?
 (1) Pollination occurs in submerged condition by water
 (2) Flowers emerge above surface of water, and pollination occurs by insects.
 (3) Flowers emerge above water surface, and pollen is carried by wind.
 (4) Male flowers are carried by water currents to female flowers at surface of water
- 165.** In which one of the following, both autogamy and geitonogamy are prevented?
 (1) Wheat (2) Papaya
 (3) Castor (4) Maize
- 166.** Match the placental types (**column-I**) with their examples (**column-II**)
- | Column-I | Column-II |
|------------------|-----------------------|
| (a) Basal | (i) Mustard |
| (b) Axile | (ii) China rose |
| (c) Parietal | (iii) <i>Dianthus</i> |
| (d) Free central | (iv) Sunflower |
- Choose the correct answer from the following options:
 (1) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)
 (2) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)
 (3) (a)-(iv), (b)-(ii), (c)-(i), (d)-(iii)
 (4) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)

- 167.** A selectable marker is used to:
- (1) help in eliminating the non-transformants, so that the transformants can be regenerated
 - (2) identify the gene for a desired trait in an alien organism
 - (3) select a suitable vector for transformation in a specific crop
 - (4) mark a gene on a chromosome for isolation using restriction enzyme
- 168.** Western Ghats have a large number of plant and animal species that are not found anywhere else. Which of the following terms will you use to notify such species?
- (1) Endemic
 - (2) Vulnerable
 - (3) Threatened
 - (4) Keystone
- 169.** Which of the following statements about ozone is correct?
- (1) Tropospheric ozone protects us from UV radiations.
 - (2) Stratospheric ozone is 'bad'
 - (3) Tropospheric ozone is 'good'
 - (4) Stratospheric ozone protects us from UV radiations.
- 170.** Exploration of molecular, genetic and species level diversity for novel products of economic importance is known as:
- (1) Biopiracy
 - (2) Bioenergetics
 - (3) Bioremediation
 - (4) Bioprospecting
- 171.** Which of the following is an innovative remedy for plastic waste?
- (1) Burning in the absence of oxygen
 - (2) Burying 500 m deep below soil surface
 - (3) Polyblend
 - (4) Electrostatic precipitator
- 172.** Between which among the following, the relationship is not an example of commensalism?
- (1) Orchid and the tree on which it grows
 - (2) Cattle Egret and grazing cattle
 - (3) Sea Anemone and Clown fish
 - (4) Female wasp and fig species
- 173.** If an agricultural field is liberally irrigated for a prolonged period of time, it is likely to face problem of:
- (1) Metal toxicity
 - (2) Alkalinity
 - (3) Acidity
 - (4) Salinity
- 174.** Which of the following statements about methanogens is not correct?
- (1) They can be used to produce biogas.
 - (2) They are found in the rumen of cattle and their excreta
 - (3) They grow aerobically and breakdown cellulose-rich food.
 - (4) They produce methane gas.
- 175.** In mung bean, resistance to yellow mosaic virus and powdery mildew were brought about by :
- (1) Mutation breeding
 - (2) Biofortification
 - (3) Tissue culture
 - (4) Hybridization and selection
- 176.** Coca alkaloid or cocaine is obtained from:
- (1) *Papaver somniferum*
 - (2) *Atropa belladonna*
 - (3) *Erythroxylum coca*
 - (4) *Datura*
- 177.** Among the following pairs of microbes, which pair has both the microbes that can be used as biofertilizers?
- (1) *Aspergillus* and *Rhizopus*
 - (2) *Rhizobium* and *Rhizopus*
 - (3) *Cyanobacteria* and *Rhizobium*
 - (4) *Aspergillus* and *Cyanobacteria*
- 178.** Given below are four statements pertaining to separation of DNA fragments using gel electrophoresis. Identify the incorrect statements.
- (a) DNA is negatively charged molecule and so it is loaded on gel towards the Anode terminal
 - (b) DNA fragments travel along the surface of the gel whose concentration does not affect movement of DNA.
 - (c) Smaller the size of DNA fragment larger is the distance it travels through it.
 - (d) Pure DNA can be visualized directly by exposing UV radiation.
- Choose correct answer from the options given below
- (1) (a), (c) and (d)
 - (2) (a), (b) and (c)
 - (3) (b), (c) and (d)
 - (4) (a), (b) and (d)
- 179.** An enzyme catalysing the removal of nucleotides from ends of DNA is:
- (1) DNA ligase
 - (2) Endonuclease
 - (3) Exonuclease
 - (4) Protease
- 180.** In RNAi, the genes are silenced using:
- (1) ds-RNA
 - (2) ss-DNA
 - (3) ss-RNA
 - (4) ds-DNA

ANSWER KEY

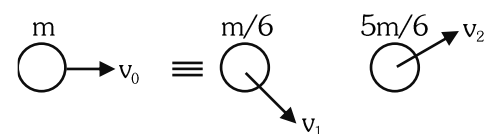
NEET(UG)-2019(Odisha)

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	4	4	4	3	1	4	4	3	4	2	2	3	2	1	1
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	4	3	3	1	2	3	4	3	4	1	1	2	3	4	4
Que.	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Ans.	2	4	1	1	2	1	2	3	3	2	2	2	2	4	1
Que.	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ans.	3	1	2	3	3	4	1	3	1	4	1	3	2	1	1
Que.	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Ans.	3	4	1	3	1	3	4	4	4	2	1	4	2	1	1
Que.	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
Ans.	3	3	3	3	2	1	1	3	2	3	3	2	4	2	4
Que.	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105
Ans.	2	3	2	2	2	2	4	4	1	3	4	4	3	2	4
Que.	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
Ans.	4	2	1	2	3	4	3	1	3	2	3	3	1	1	2
Que.	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135
Ans.	2	3	3	2	4	2	3	1	2	2	4	4	2	3	4
Que.	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
Ans.	4	2	1	1	1	3	3	3	2	4	3	3	2	1	4
Que.	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165
Ans.	3	1	2	2	2	2	3	3	3	3	3	4	3	4	2
Que.	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
Ans.	3	1	1	4	4	3	4	4	3	1	3	3	4	3	1

HINT - SHEET

1. (A) (B)
 R $2R$
 σ σ
 Total charge = $\sigma \times 4\pi R^2 + \sigma \times 4\pi (2R)^2 = 20\sigma\pi R^2$
 $\frac{Q_A}{Q_B} = \frac{1}{2}$
 $Q_A = \frac{20}{3}\sigma\pi R^2$ and $Q_B = \frac{40}{3}\sigma\pi R^2$
 $\sigma_A = \frac{Q_A}{\text{area}} = \frac{20}{3} \frac{\sigma\pi R^2}{4\pi R^2} = \frac{5\sigma}{3}$
 $\sigma_B = \frac{40\sigma\pi R^2}{4\pi(2R)^2} = \frac{5\sigma}{6}$
2. Distance in one oscillation = $4A$
3. Time of flight = $\sqrt{\frac{2h}{g}} \propto \frac{1}{\sqrt{g}}$
 Time period of pendulum = $2\pi\sqrt{\frac{l}{g}} \propto \frac{1}{\sqrt{g}}$
 Ratio of time of flight & time period of pendulum is independent of g . Hence $t' = 2T'$

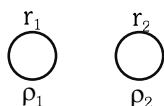
4. Here $\lambda = 2(l_2 - l_1)$
 where $l_1 = 9.75$ cm, $l_2 = 31.25$ cm
 so $v = 2n(l_2 - l_1) = 2 \times 800(31.25 - 9.75) = 344$ m/s

5. 

Conservation of linear momentum,

- $$m\vec{v}_0 = \frac{m}{6}\vec{v}_1 + \frac{5m}{6}\vec{v}_2$$
- $$\Rightarrow m(20\hat{i} + 25\hat{j} - 12\hat{k}) = \frac{m}{6}(100\hat{i} + 35\hat{j} + 8\hat{k}) + \frac{5m}{6}\vec{v}_2$$
- $$\Rightarrow \vec{v}_2 = 4\hat{i} + 23\hat{j} - 16\hat{k}$$
6. $\frac{T_1 - T_2}{t} = K\left(\frac{T_1 + T_2}{2} - T_s\right)$
 $\frac{80 - 70}{12} = K\left(\frac{80 + 70}{2} - 25\right) \quad \dots(1)$
 $\frac{70 - 60}{t} = K\left(\frac{70 + 60}{2} - 25\right) \quad \dots(2)$
 on solving : $t = 15$ min

7.



$$v_T = \frac{2r^2(\sigma - \rho)g}{9\eta}$$

$$\frac{v_1}{v_2} = \left(\frac{r_1}{r_2}\right)^2 \frac{(\sigma_1 - \rho)}{(\sigma_2 - \rho)}$$

$$= \left(\frac{1}{2}\right)^2 \left(\frac{8\rho_2 - 0.1\rho_2}{\rho_2 - 0.1\rho_2}\right) = \frac{79}{36}$$

8.

$$\theta = (2\pi n), \omega_0 = 0, \omega = V_0/r$$

$$\alpha = \frac{\omega^2 - \omega_0^2}{2\theta} = \frac{(V_0/r)^2 - 0}{2(2\pi n)} = \frac{V_0^2}{4\pi n r^2}$$

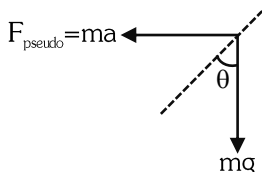
9.

$$t = \sqrt{\frac{2h}{a_{rel}}}$$

In both cases $a_{rel} = g - 0 = g$.

Hence $t_1 = t_2$

10.



$$\tan \theta = \frac{F_{pseudo}}{mg} = \frac{a}{g} \text{ towards left}$$

11.

$$\rho_{oil} h_{oil} = \rho_{water} h_{water}$$

$$\Rightarrow \rho_{oil} = \frac{1000(15)}{20} = 750 \text{ kg m}^{-3}$$

12.

$$KA \frac{[0 - (-26)]}{x} dt = A(dx)\rho L \Rightarrow \frac{dx}{dt} = \frac{26K}{\rho L x}$$

13.

$$\lambda = \frac{1240 \text{ nm}}{1.9} = 652.6 \text{ nm} \simeq 654 \text{ nm}$$

A B Y

0 0 1

14.

0 1 0

1 0 0

1 1 0

15.

Hydrogen $\rightarrow 7/5$ (diatomic),

Helium $\rightarrow 5/3$ (monoatomic), X $\rightarrow 9/7$

16.

Focal length do not change \rightarrow Power do not change

17.

Path difference for n^{th} minima $= (2n - 1)\frac{\lambda}{2}$

For fifth minima ($n=5$) $= \frac{9\lambda}{2}$

18.

$$\frac{1}{f} = \left(\frac{\mu_2 - \mu_1}{\mu_1}\right) \left(\frac{1}{R_1} - \frac{1}{R_2}\right)$$

$$\Rightarrow \frac{1}{25} = \left(\frac{1.5 - 1}{1}\right) \left(\frac{1}{R} - \frac{1}{-2R}\right)$$

$$\Rightarrow \frac{2}{25} = \frac{3}{2R} \Rightarrow R = \frac{75}{4} = 18.75$$

19.

$$t = \frac{d}{v_{rel}} = \frac{100}{50} = 2s$$

$$s_y = -\frac{1}{2}gt^2 = -\frac{1}{2} \times 10 \times 4 = -20$$

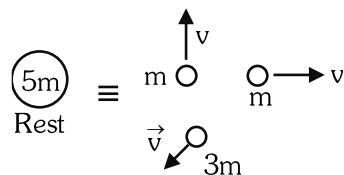
\therefore Height = 180 m

21.

$N = mg, F = f$

$$\text{Resultant} = \sqrt{N^2 + f^2} = \sqrt{(mg)^2 + f^2} \leq mg\sqrt{1 + \mu^2}$$

22.



$$3m\vec{v} + m\vec{v}_i + m\vec{v}_j = 0$$

$$\Rightarrow \vec{v} = -\frac{v}{3}\hat{i} - \frac{v}{3}\hat{j} \quad |\vec{v}| = \sqrt{2}\frac{v}{3}$$

Energy released

$$= \frac{1}{2}mv^2 + \frac{1}{2}mv^2 + \frac{1}{2}(3m)\left(\frac{2v^2}{9}\right) = \frac{4}{3}mv^2$$

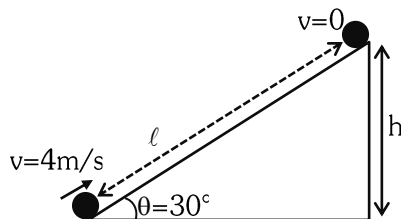
23. $W = \Delta KE$

$$\text{At } x=8 : 130 = \frac{1}{2} \left(\frac{1}{2} \right) v^2$$

$$\Rightarrow v = 2\sqrt{130} = 22.8 \text{ ms}^{-1}$$

$$\text{For } x=12 : v = 20.6 \text{ ms}^{-1}$$

24.



$$\frac{1}{2}mv^2 \left(1 + \frac{K^2}{R^2} \right) = mgh$$

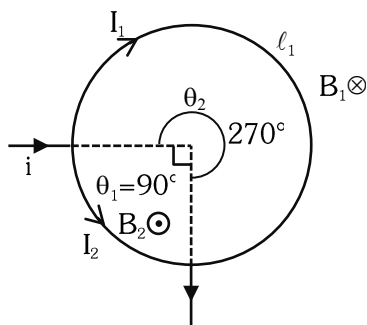
$$\Rightarrow 8 \left(1 + \frac{1}{2} \right) = 10h \Rightarrow h = 1.2 \text{ m}$$

$$\frac{h}{l} = \sin 30^\circ \Rightarrow l = 2.4 \text{ m}$$

25. $B = \frac{\mu_0 Ni}{2\pi r}$

$$\frac{B_1}{B_2} = \frac{N_1}{N_2} \frac{r_2}{r_1} = \left(\frac{200}{100} \right) \left(\frac{20}{40} \right) = 1 : 1$$

26. $\frac{R_1}{R_2} = \frac{\ell_1}{\ell_2} = \frac{I_2}{I_1} = \frac{\theta_1}{\theta_2}$



$$\Rightarrow \theta_1 I_1 = \theta_2 I_2$$

$$\left. \begin{aligned} B_1 &= \frac{\mu_0}{4\pi} \frac{I_1 \theta_1}{r} \\ B_2 &= \frac{\mu_0}{4\pi} \frac{I_2 \theta_2}{r} \end{aligned} \right\} \Rightarrow B_1 = B_2$$

B_1 and B_2 are in opposite directions, hence resultant field at centre is zero.

27. Changing polarity is termed as AC.

28. $m_\mu = 207m_e$, $q_\mu = q_{e^-}$, $M_{\text{nucleus}} = 1836m_e$

Reduced mass

$$\mu = \frac{mM}{M+m} = \frac{207m_e \times 1836m_e}{207m_e + 1836m_e} = 186m_e$$

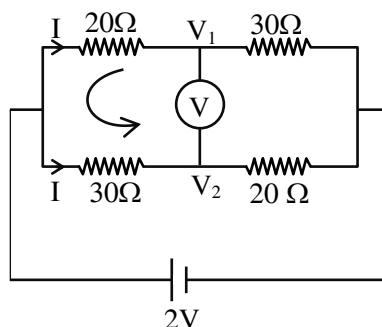
$$\therefore r_1 = \frac{n^2 h^2}{4\pi^2 m k z e^2} = 0.51 \text{ \AA} \text{ (Given in Question)}$$

Radius of first orbit of new atom

$$r'_1 = \frac{m_e r_1}{\mu} = \frac{m_e}{186m_e} \times 0.51 \text{ \AA} = 2.56 \times 10^{-13} \text{ m}$$

$$E'_1 = \frac{\mu}{m} E_1 = \frac{186m_e}{m_e} (-13.6 \text{ eV}) = -2.8 \text{ keV}$$

29.

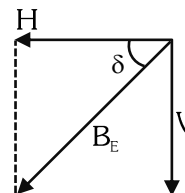


$$(V_1 - V_2) = \frac{30}{25} - \frac{20}{25} = \frac{10}{25} = \frac{2}{5} = 0.4 \text{ V}$$

30. Interchanging cell and galvanometer do not effect balance condition.

31. $V = B_E \sin \delta$

$$H = B_E \cos \delta$$



32. $T_{1/2} = 2.2 \times 10^9 \text{ s}$, $R = 10^{10} \text{ s}^{-1}$, $R = N\lambda$

$$N = \frac{R}{\lambda} = \frac{R}{0.693} T_{1/2} = \frac{10^{10} \times 2.2 \times 10^9}{0.693}$$

$$= 3.17 \times 10^{19} \text{ atoms}$$

33. Kepler's Third Law :-

$$T \propto r^{3/2}$$

$$\frac{T_2}{T_1} = \left(\frac{r_2}{r_1} \right)^{3/2} = \left(\frac{R+2.5R}{R+6R} \right)^{3/2} = \frac{1}{2\sqrt{2}}$$

$$\Rightarrow T_2 = \frac{24}{2\sqrt{2}} = 6\sqrt{2} \text{ hours}$$

$$34. Z = \frac{12}{0.2} = 60 \Omega \text{ and } R = \frac{12}{0.4} = 30 \Omega$$

$$35. E = \frac{B\omega\ell^2}{2} = \frac{0.1(10)(0.5)^2}{2} = 0.125 \text{ V}$$

$$36. v = \frac{1}{\sqrt{\mu \epsilon}} = \frac{1}{\sqrt{\mu_r \epsilon_r \mu_0 \epsilon_0}} = \frac{3 \times 10^8}{\sqrt{1.44}} \\ = \frac{30}{12} \times 10^8 = 2.5 \times 10^8 \text{ ms}^{-1}$$

$$37. \phi = \frac{q_{in}}{\epsilon_0} = 0$$

$$38. U_{initial} = \frac{1}{2} CV^2,$$

$$\text{Loss} = \frac{C.C}{2(C+C)} (V-0)^2 = \frac{1}{4} CV^2$$

$$\% \text{ Loss} = \frac{\frac{1}{4} CV^2}{\frac{1}{2} CV^2} \times 100 = 50\%$$

$$39. n(\text{VSD}) = (n-1)\text{MSD} \Rightarrow 1 \text{ VSD} = \frac{(n-1)}{n} \text{ MSD}$$

$$\text{Least count} = 1 \text{ MSD} - 1 \text{ VSD} = \left[1 - \frac{(n-1)}{n} \right]$$

$$\text{MSD} = \frac{1}{n} \text{ MSD} = \frac{1}{n} \left(\frac{1}{n} \right) \text{ cm} = \frac{1}{n^2} \text{ cm}$$

$$40. \text{Average velocity} = \frac{\text{Total distance}}{\text{Total time}} = \frac{x+x}{\frac{x}{v_1} + \frac{x}{v_2}}$$

$$\Rightarrow v = \frac{2}{\frac{1}{v_1} + \frac{1}{v_2}} \Rightarrow \frac{2}{v} = \frac{1}{v_1} + \frac{1}{v_2}$$

$$41. \Delta U = -GMm \left[\frac{1}{r_f} - \frac{1}{r_i} \right]$$

$$= -GMm \left[\frac{1}{R+h} - \frac{1}{R} \right] = \frac{GMmh}{R(R+h)}$$

$$42. Q = \Delta U + W \Rightarrow mL = \Delta U + P(V_2 - V_1)$$

$$\Rightarrow 1(2256) = \Delta U + 1 \times 10^5 (1670 \times 10^{-6})$$

$$\Rightarrow \Delta U = 2089 \text{ J}$$

$$43. \text{Angular width} \propto \frac{\lambda}{d}$$

$$\Rightarrow \frac{\theta_0}{0.7\theta_0} = \frac{\frac{6000 \text{ \AA}}{d}}{\frac{\lambda}{d}}$$

$$\Rightarrow \lambda = 4200 \text{ \AA}$$

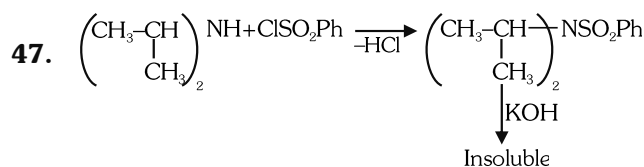
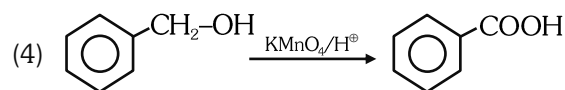
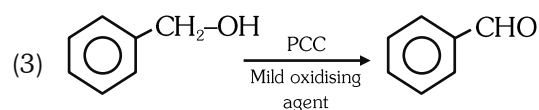
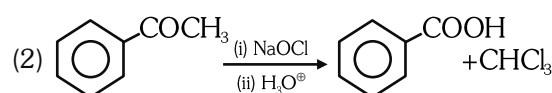
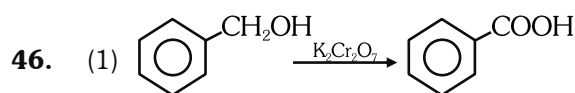
$$44. \phi = \frac{hc}{\lambda}$$

$$\Rightarrow 4 \text{ eV} = \frac{1240}{\lambda}$$

$$\Rightarrow \lambda = \frac{1240}{4} = 310 \text{ nm}$$

$$45. \lambda = \frac{h}{\sqrt{2mE_k}} \quad (\because E_k \text{ is same for both})$$

$$\Rightarrow \frac{\lambda_p}{\lambda_\alpha} = \sqrt{\frac{4m}{m}} = 2:1$$

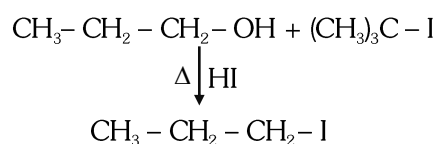
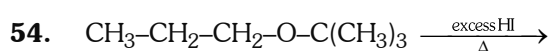
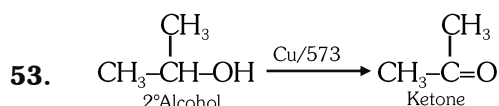


48. During denaturation 2° and 3° structures are destroyed but 1° structure remains intact.

49. Polyacrylonitrile is used as substitute for wool in making commercial fibres as Orlon or Acrilan.

50. Sucralose is stable at cooking temperature and does not provide calories.

52. Aryl halides don't show NSR easily at room temperature.



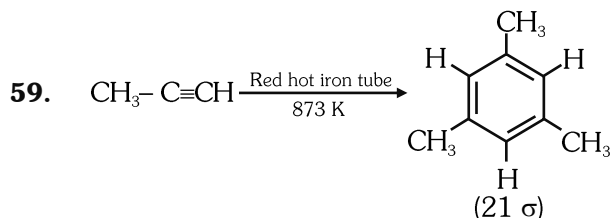
55. $\text{Na}_2\text{O} \rightarrow$ Basic

$\text{Al}_2\text{O}_3 \rightarrow$ Amphoteric

$\text{N}_2\text{O} \rightarrow$ Neutral

$\text{Cl}_2\text{O}_7 \rightarrow$ Acidic

57. Due to +H effect of alkyl group (more αH)



60. AlCl_3 in acidified aqueous solution form a $[\text{Al}(\text{H}_2\text{O})_6]^{3+}$

$\text{Al}^{+3} = [\text{Ne}]$

sp^3d^2

62. Contaminated undesired material present in an ore is called gangue.

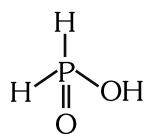
63. $\text{Ca}_3\text{P}_2 + \text{H}_2\text{O} \rightarrow \text{Ca}(\text{OH})_2 + \text{PH}_3$
(x) Colourless gas (y)

$\text{CuSO}_4 + \text{PH}_3 \rightarrow \text{Cu}_3\text{P}_2 + \text{H}_2\text{SO}_4$

(y)

hence X is Ca_3P_2 (Calcium phosphide)

64. Reducing property \propto no. of P-H bond
 H_3PO_2 contains maximum P-H bond,



65. Oleum \rightarrow pyrosulphuric acid ($\text{H}_2\text{S}_2\text{O}_7$)

66. $\text{KMnO}_4 + \text{I}^- + \text{OH}^- \longrightarrow \text{MnO}_2 + \text{IO}_3^- + \text{H}_2\text{O}$
(x)

67.
$$\Delta_{\text{tetrahedral}} = \frac{4}{9} \times \Delta_{\text{octahedral}}$$

$$= \frac{4}{9} \times 18000$$

$$= 8000 \text{ cm}^{-1}$$

68. $\text{CH}_3\text{COOH} \rightarrow \text{CH}_3\text{COO}^- + \text{H}^+$... (1)

$\text{H}_2\text{SO}_4 \rightarrow 2\text{H}^+ + \text{SO}_4^{2-}$... (2)

$\text{K}_2\text{SO}_4 \rightarrow 2\text{K}^+ + \text{SO}_4^{2-}$... (3)

$\text{CH}_3\text{COOK} \rightarrow \text{CH}_3\text{COO}^- + \text{K}^+$... (4)

According to Kohlrausch's law-

$$\lambda_{\text{CH}_3\text{COOH}}^\circ = \lambda_{\text{CH}_3\text{COO}^-}^\circ + \lambda_{\text{H}^+}^\circ$$

$$\text{eq. (1)} = \text{eq. (4)} + \text{eq. (2)} - \text{eq. (3)}$$

$$\therefore \lambda_{\text{CH}_3\text{COOH}}^\circ = z + \frac{x}{2} - \frac{y}{2}$$

$$\lambda_{\text{CH}_3\text{COOH}}^\circ = \frac{(x-y)}{2} + z(S \times \text{cm}^2 \text{mol}^{-1})$$

69. For a first order reaction; $t_{1/2} = \frac{0.693}{K}$

$$t_{1/2} = \frac{0.693}{2.303 \times 10^{-3}} = 301 \text{ s}$$

The time required for 40 g of reactant to reduce to 10g

$$t_{75\%} = 2 \times t_{1/2}$$

$$t_{75\%} = 2 \times 301 = \mathbf{602 \text{ s}}$$

70. $\log\left(\frac{K_2}{K_1}\right) = \frac{E_a}{2.303R} \left(\frac{1}{T_1} - \frac{1}{T_2}\right)$

$E_a = 0$

$\log\left(\frac{K_2}{K_1}\right) = 0$

$\frac{K_2}{K_1} = 10^0 = 1 \Rightarrow K_2 = K_1$

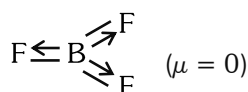
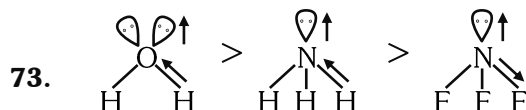
$K_2 = 1.6 \times 10^6 \text{ s}^{-1} \text{ at } 400\text{K}$

71. Freundlich adsorption isotherm is $\frac{x}{m} = K(P)^{1/n}$

In it, value of $1/n$ lies in between 0 to 1. So,

correct option is $\frac{x}{m} = KP^{0.3}$

72. According to MOT



74. Crude NaCl obtained by crystallisation of brine solution contains Na_2SO_4 , CaCl_2 , MgCl_2 & CaSO_4 .

(hence ans is MgSO_4 . not present as impurities)

75. Li^+ having maximum hydration tendency.

LiCl forms dihydrated salt $\text{LiCl} \cdot 2\text{H}_2\text{O}$ in IA group.

76. NaOH(aq) is strong base solution

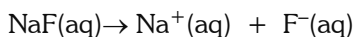
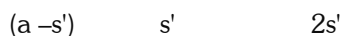
So, $[\text{OH}^-] = N = 10^{-2}N$

$\text{pOH} = -\log[\text{OH}^-] = -\log 10^{-2} = 2$

$\text{pH} = 14 - \text{pOH} = 14 - 2$

$\text{pH} = 12$

77. HCl cannot act both as Bronsted acid and Bronsted base because HCl can only donate proton.



In solution- $[\text{F}^-] = (2s' + C)$

$[\text{F}^-] \approx C$ (due to common ion effect)

$K_{\text{sp}(\text{CaF}_2)} = [\text{Ca}^{+2}][\text{F}^-]^2$

$K_{\text{sp}(\text{CaF}_2)} = s' \cdot C^2$

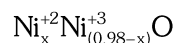
$s' = \frac{5.3 \times 10^{-11}}{(10^{-1})^2}$

$s' = 5.3 \times 10^{-9} \text{ mol L}^{-1}$

80. In $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$, only one water molecule take part in hydrogen bonding.

81. Let, Ni^{+2} in the crystal $\text{Ni}_{0.98}\text{O}$ be x.

$\therefore \text{Ni}^{+3}$ in the crystal $\text{Ni}_{0.98}\text{O}$ will be $(0.98 - x)$



By law of conservation of charge

$2x + 3 \times (0.98 - x) - 2 = 0$

$x = 0.94$

So, the fraction of Ni^{+2} ions in the crystal = $\frac{0.94}{0.98}$
 ≈ 0.96

82. If, intermolecular attractive forces between **A – A** and **B – B** are **stronger** than those **A – B** then it show positive deviation from ideal behaviour.

83. $X_{\text{H}_2\text{O}} = 0.02$

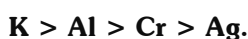
$\therefore X_{\text{gas}} = 0.98$

$P_{\text{total}} = 1.2 \text{ atm}$

partial pressure of dry-air = $P_T \times$ mole fraction of dry-air

Partial pressure of dry-air = $1.2 \text{ atm} \times 0.98$
 $= 1.176 \text{ atm.}$

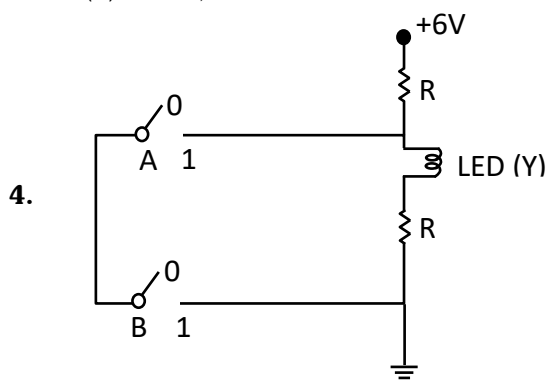
84. Reducing power of metal $\propto \frac{1}{\text{SRP}}$



- 85.** 2 M solution of NaOH means 2 mole NaOH is present in 1 L solution;
density = 1.28 g/ml
mass of solution = volume of solution \times density
= 1200×1.28
= 1280 g
mass of solvent = mass of solution – mass of solute
= $1280 - 80$
= 1200 g
molality = $\frac{2}{1200} \times 1000 = \frac{20}{12} = \frac{10}{6} = \frac{5}{3} = \mathbf{1.67\ m}$
- 86.** Orbital having angular node (ℓ) = 3
Total node = Radial node + angular node
= $n - \ell - 1 + \ell$
 $3 = n - 1$
 $n = 4$
Subshell " $n\ell$ " = **4f**
- 87.** $n\lambda = 2\pi r$
 $n\lambda = 2\pi \frac{n^2}{z} a_0$
 $n\lambda = 2\pi \times \frac{n^2}{z} \times 52.9\text{ pm}$
 $\lambda = 2\pi \times 52.9 \times 2\text{ pm}$
= **$211.6\ \pi\text{ pm}$**
- 88.** $PV = nRT$
 $n = 1.8/18 = 0.1\text{ mole}$
 $P = 1\text{ bar}$
 $T = 374 + 273$
= 647 K
 $V = \frac{nRT}{P} = \frac{0.1 \times 0.083 \times 647}{1} = \mathbf{5.37\ L}$
- 89.** $W_{PV} = -P_{\text{ext}} (V_f - V_i)$
= $-10^5\text{ Nm}^{-2}(10^{-2}\text{ m}^3 - 10^{-3}\text{ m}^3)$
= $-10^5\text{ Nm}^{-2} \times 10^{-3} [10 - 1]\text{m}^3$
= **-900 J**
- 90.** In adiabatic expansion cooling effect will take place, T_C will be less than T_A .
in adiabatic expansion $q = 0$
 $\Delta U = w$
 $w_{PV} < 0$
 $\Delta U < 0$
 $nC_{vm} \Delta T < 0$
 $\Delta T < 0$
 $T_C - T_A < 0$
 $T_C < T_A$
- 149.** In official answer key released by **NTA**, answer of this question was given (1) in reference to Prokaryotes by default instead of Eukaryotes.

NEET(UG) – 2019

- In which of the following processes, heat is neither absorbed nor released by a system?
(1) isothermal (2) adiabatic
(3) isobaric (4) isochoric
- Increase in temperature of a gas filled in a container would lead to :
(1) increase in its mass
(2) increase in its kinetic energy
(3) decrease in its pressure
(4) decrease in intermolecular distance
- The total energy of an electron in an atom in an orbit is -3.4 eV. Its kinetic and potential energies are, respectively:
(1) -3.4 eV, -3.4 eV
(2) -3.4 eV, -6.8 eV
(3) 3.4 eV, -6.8 eV
(4) 3.4 eV, 3.4 eV

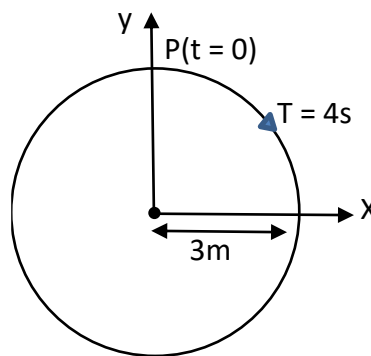


The correct Boolean operation represented by the circuit diagram drawn is :

- (1) AND (2) OR
(3) NAND (4) NOR
- A block of mass 10 kg is in contact against the inner wall of a hollow cylindrical drum of radius 1 m. The coefficient of friction between the block and the inner wall of the cylinder is 0.1 . The minimum angular velocity needed for the cylinder to keep the block stationary when the cylinder is vertical and rotating about its axis, will be :
($g = 10$ m/s²)
(1) $\sqrt{10}$ rad/s (2) $\frac{10}{2\pi}$ rad/s
(3) 10 rad/s (4) 10π rad/s

- Body A of mass $4m$ moving with speed u collides with another body B of mass $2m$, at rest. The collision is head on and elastic in nature. After the collision the fraction of energy lost by the colliding body A is :
(1) $\frac{1}{9}$ (2) $\frac{8}{9}$
(3) $\frac{4}{9}$ (4) $\frac{5}{9}$
- The speed of a swimmer in still water is 20 m/s. The speed of river water is 10 m/s and is flowing due east. If he is standing on the south bank and wishes to cross the river along the shortest path, the angle at which he should make his strokes w.r.t. north is given by :
(1) 30° west (2) 0°
(3) 60° west (4) 45° west
- A mass m is attached to a thin wire and whirled in a vertical circle. The wire is most likely to break when :
(1) the mass is at the highest point
(2) the wire is horizontal
(3) the mass is at the lowest point
(4) inclined at an angle of 60° from vertical
- The displacement of a particle executing simple harmonic motion is given by
 $y = A_0 + A \sin \omega t + B \cos \omega t$.
Then the amplitude of its oscillation is given by :
(1) $A_0 + \sqrt{A^2 + B^2}$ (2) $\sqrt{A^2 + B^2}$
(3) $\sqrt{A_0^2 + (A + B)^2}$ (4) $A + B$
- A 800 turn coil of effective area 0.05 m² is kept perpendicular to a magnetic field 5×10^{-5} T. When the plane of the coil is rotated by 90° around any of its coplanar axis in 0.1 s, the emf induced in the coil will be :
(1) 2 V (2) 0.2 V
(3) 2×10^{-3} V (4) 0.02 V

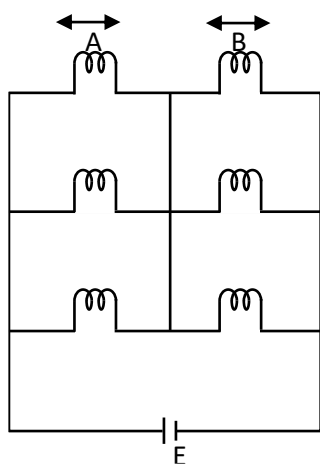
11. Average velocity of a particle executing SHM in one complete vibration is :
- (1) $\frac{A\omega}{2}$ (2) $A\omega$
 (3) $\frac{A\omega^2}{2}$ (4) Zero
12. A soap bubble, having radius of 1 mm, is blown from a detergent solution having a surface tension of 2.5×10^{-2} N/m. The pressure inside the bubble equals at a point Z_0 below the free surface of water in a container. Taking $g = 10 \text{ m/s}^2$ density of water = 10^3 kg/m^3 , the value of Z_0 is :-
- (1) 100 cm (2) 10 cm
 (3) 1 cm (4) 0.5 cm
13. A copper rod of 88 cm and an aluminum rod of unknown length have their increase in length independent of increase in temperature. The length of aluminum rod is :
- ($\alpha_{\text{Cu}} = 1.7 \times 10^{-5} \text{ K}^{-1}$ and $\alpha_{\text{Al}} = 2.2 \times 10^{-5} \text{ K}^{-1}$)
- (1) 6.8 cm (2) 113.9 cm
 (3) 88 cm (4) 68 cm
14. The unit of thermal conductivity is :
- (1) J m K^{-1} (2) $\text{J m}^{-1} \text{K}^{-1}$
 (3) W m K^{-1} (4) $\text{W m}^{-1} \text{K}^{-1}$
15. When a block of mass M is suspended by a long wire of length L , the length of the wire become $(L + l)$. The elastic potential energy stored in the extended wire is :-
- (1) Mgl (2) MgL
 (3) $\frac{1}{2} Mgl$ (4) $\frac{1}{2} MgL$
16. A disc of radius 2m and mass 100 kg rolls on a horizontal floor. Its centre of mass has speed of 20 cm/s . How much work is needed to stop it ?
- (1) 3J (2) 30 kJ
 (3) 2 J (4) 1 J
17. In an experiment, the percentage of error occurred in the measurement of physical quantities A, B, C and D are 1%, 2%, 3% and 4% respectively. Then the maximum percentage of error in the measurement X, where $X = \frac{A^2 B^{1/2}}{C^{1/3} D^3}$, will be :
- (1) $\left(\frac{3}{13}\right)\%$ (2) 16%
 (3) -10% (4) 10%
18. A body weighs 200 N on the surface of the earth. How much will it weigh half way down to the centre of the earth ?
- (1) 150 N (2) 200 N
 (3) 250 N (4) 100 N
19. Which colour of the light has the longest wavelength ?
- (1) red (2) blue (3) green (4) violet
20. A solid cylinder of mass 2 kg and radius 4 cm is rotating about its axis at the rate of 3 rpm. The torque required to stop after 2π revolutions is :
- (1) $2 \times 10^{-6} \text{ N m}$ (2) $2 \times 10^{-3} \text{ N m}$
 (3) $12 \times 10^{-4} \text{ N m}$ (4) $2 \times 10^6 \text{ N m}$
21. The radius of circle, the period of revolution, initial position and sense of revolution are indicated in the fig.



y-projection of the radius vector of rotating particle P is :

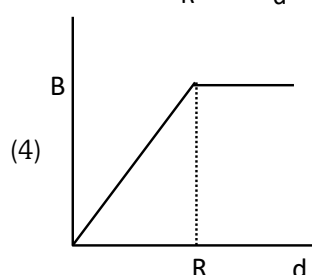
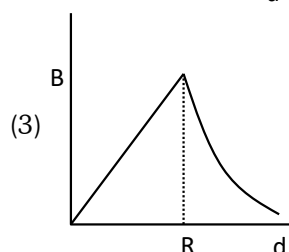
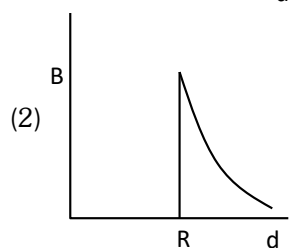
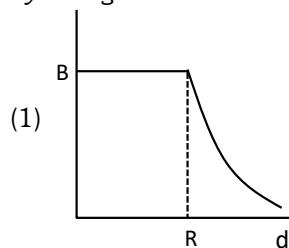
- (1) $y(t) = -3\cos 2\pi t$, where y in m
 (2) $y(t) = 4\sin\left(\frac{\pi t}{2}\right)$, where y in m
 (3) $y(t) = 3\cos\left(\frac{3\pi t}{2}\right)$, where y in m
 (4) $y(t) = 3\cos\left(\frac{\pi t}{2}\right)$, where y in m

22. A hollow metal sphere of radius R is uniformly charged. The electric field due to the sphere at a distance r from the centre :
- increases as r increases for $r < R$ and for $r > R$
 - zero as r increases for $r < R$, decreases as r increases for $r > R$
 - zero as r increases for $r < R$, increases as r increases for $r > R$
 - decreases as r increases for $r < R$ and for $r > R$
23. In which of the following devices, the eddy current effect is **not** used ?
- induction furnace
 - magnetic braking in train
 - electromagnet
 - electric heater
24. Six similar bulbs are connected as shown in the figure with a DC source of emf E , and zero internal resistance.
- The ratio of power consumption by the bulbs when (i) all are glowing and (ii) in the situation when two from section A and one from section B are glowing, will be :



- 4 : 9
 - 9 : 4
 - 1 : 2
 - 2 : 1
25. At a point A on the earth's surface the angle of dip, $\delta = +25^\circ$. At a point B on the earth's surface the angle of dip, $\delta = -25^\circ$. We can interpret that:
- A and B are both located in the northern hemisphere.
 - A is located in the southern hemisphere and B is located in the northern hemisphere.
 - A is located in the northern hemisphere and B is located in the southern hemisphere.
 - A and B are both located in the southern hemisphere

26. A force $F = 20 + 10y$ acts on a particle in y -direction where F is in newton and y in meter. Work done by this force to move the particle from $y = 0$ to $y = 1$ m is :
- 30 J
 - 5 J
 - 25 J
 - 20 J
27. Pick the **wrong** answer in the context with rainbow.
- When the light rays undergo two internal reflections in a water drop, a secondary rainbow is formed.
 - The order of colours is reversed in the secondary rainbow.
 - An observer can see a rainbow when his front is towards the sun.
 - Rainbow is a combined effect of dispersion refraction and reflection sunlight.
28. A cylindrical conductor of radius R is carrying a constant current. The plot of the magnitude of the magnetic field, B with the distance d , from the centre of the conductor, is **correctly** represented by the figure :



29. Two particles A and B are moving in uniform circular motion in concentric circles of radius r_A and r_B with speed v_A and v_B respectively. The time period of rotation is the same. The ratio of angular speed of A to that of B will be :
- (1) $r_A : r_B$ (2) $v_A : v_B$
(3) $r_B : r_A$ (4) 1 : 1
30. Two similar thin equi-convex lenses, of focal length f each, are kept coaxially in contact with each other such that the focal length of the combination is F_1 . When the space between the two lenses is filled with glycerin (which has the same refractive index ($\mu = 1.5$) as that of glass) then the equivalent focal length is F_2 . The ratio $F_1 : F_2$ will be :
- (1) 2 : 1 (2) 1 : 2
(3) 2 : 3 (4) 3 : 4
31. In total internal reflection when the angle of incidence is equal to the critical angle for the pair of media in contact, what will be angle of refraction?
- (1) 180°
(2) 0°
(3) equal to angle of incidence
(4) 90°
32. Two parallel infinite line charges with linear charge densities $+\lambda$ C/m and $-\lambda$ C/m are placed at a distance of $2R$ in free space. What is the electric field mid-way between the two line charges?
- (1) zero
(2) $\frac{2\lambda}{\pi \epsilon_0 R}$ N/C
(3) $\frac{\lambda}{\pi \epsilon_0 R}$ N/C
(4) $\frac{\lambda}{2\pi \epsilon_0 R}$ N/C
33. For a p-type semiconductor which of the following statements is **true** ?
- (1) Electrons are the majority carriers and trivalent atoms are the dopants.
(2) Holes are the majority carriers and trivalent atoms are the dopants.
(3) Holes are the majority carriers and pentavalent atoms are the dopants.
(4) Electrons are the majority carriers and pentavalent atoms are the dopants.

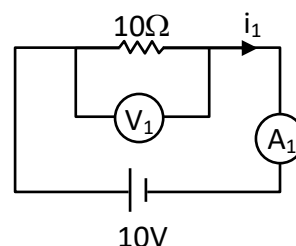
34. Which of the following acts as a circuit protection device?

(1) conductor (2) inductor
(3) switch (4) fuse

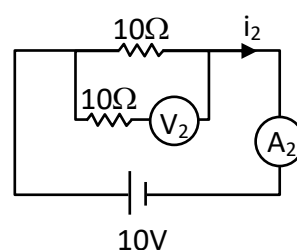
35. A parallel plate capacitor of capacitance $20\mu\text{F}$ is being charged by a voltage source whose potential is changing at the rate of 3 V/s . The conduction current through the connecting wires, and the displacement current through the plates of the capacitor, would be, respectively :

(1) zero, $60\mu\text{A}$
(2) $60\mu\text{A}$, $60\mu\text{A}$
(3) $60\mu\text{A}$, zero
(4) zero, zero

36. In the circuits shown below, the readings of the voltmeters and the ammeters will be :



Circuit 1



Circuit 2

- (1) $V_2 > V_1$ and $i_1 = i_2$
(2) $V_1 = V_2$ and $i_1 > i_2$
(3) $V_1 = V_2$ and $i_1 = i_2$
(4) $V_2 > V_1$ and $i_1 > i_2$
37. α -particle consists of :
- (1) 2 protons and 2 neutrons only
(2) 2 electrons, 2 protons and 2 neutrons
(3) 2 electrons and 4 protons only
(4) 2 protons only

38. An electron is accelerated through a potential difference of 10,000 V. Its de Broglie wavelength is, (nearly): ($m_e = 9 \times 10^{-31}$ kg)

(1) 12.2×10^{-13} m
(2) 12.2×10^{-12} m
(3) 12.2×10^{-14} m
(4) 12.2 nm

39. When an object is shot from the bottom of a long smooth inclined plane kept at an angle 60° with horizontal, it can travel a distance x_1 along the plane. But when the inclination is decreased to 30° and the same object the shot with the same velocity, it can travel x_2 distance. Then $x_1 : x_2$ will be

(1) $1 : \sqrt{2}$
(2) $\sqrt{2} : 1$
(3) $1 : \sqrt{3}$
(4) $1 : 2\sqrt{3}$

40. A small hole of area of cross-section 2 mm^2 is present near the bottom of a fully filled open tank of height 2 m. Taking $g = 10 \text{ m/s}^2$, the rate of flow of water through the open hole would be nearly :

(1) $12.6 \times 10^{-6} \text{ m}^3/\text{s}$
(2) $8.9 \times 10^{-6} \text{ m}^3/\text{s}$
(3) $2.23 \times 10^{-6} \text{ m}^3/\text{s}$
(4) $6.4 \times 10^{-6} \text{ m}^3/\text{s}$

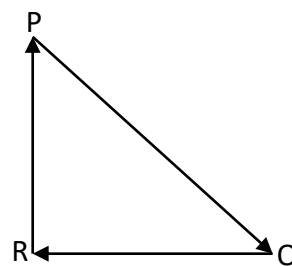
41. Two point charges A and B, having charges $+Q$ and $-Q$ respectively, are placed at certain distance apart and force acting between them is F . If 25% charge of A is transferred to B, then force between the charges becomes:

(1) F
(2) $\frac{9F}{16}$
(3) $\frac{16F}{9}$
(4) $\frac{4F}{3}$

42. Ionized hydrogen atoms and α -particles with same momenta enters perpendicular to a constant magnetic field B . The ratio of their radii of their paths $r_H : r_\alpha$ will be

(1) 2 : 1
(2) 1 : 2
(3) 4 : 1
(4) 1 : 4

43. A particle moving with velocity \vec{V} is acted by three forces shown by the vector triangle PQR. The velocity of the particle will :



(1) increase
(2) decrease
(3) remain constant
(4) change according to the smallest force \vec{QR}

44. The work done to raise a mass m from the surface of the earth to a height h , which is equal to the radius of the earth, is :

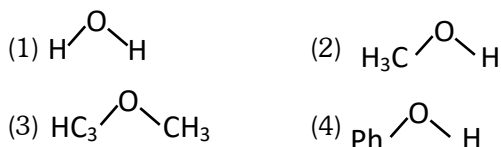
(1) mgR
(2) $2 mgR$
(3) $\frac{1}{2} mgR$
(4) $\frac{3}{2} mgR$

45. In a double slit experiment, when light of wavelength 400 nm was used, the angular width of the first minima formed on a screen placed 1m away, was found to be 0.2° . What will be the angular width of the first minima, if the entire experimental apparatus is immersed in water

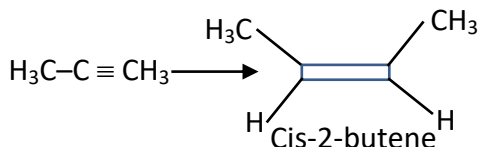
($\mu_{\text{water}} = 4/3$)
(1) 0.266°
(2) 0.15°
(3) 0.05°
(4) 0.1°

46. Under isothermal condition, a gas at 300 K expands from 0.1L to 0.25L against a constant external pressure of 2 bar. The work done by the gas is :-
[Given that 1L bar = 100 J]
(1) -30 J (2) 5kJ
(3) 25 J (4) 30 J
47. A compound is formed by cation C and anion A. The anions form hexagonal close packed (hcp) lattice and the cations occupy 75% of octahedral voids. The formula of the compound is :-
(1) C_2A_3 (2) C_3A_2
(3) C_3A_4 (4) C_4A_3
48. pH of a saturated solution of $Ca(OH)_2$ is 9. The solubility product (K_{sp}) of $Ca(OH)_2$ is :-
(1) 0.5×10^{-15} (2) 0.25×10^{-10}
(3) 0.125×10^{-15} (4) 0.5×10^{-10}
49. The number of moles of hydrogen molecules required to produce 20 moles of ammonia through Haber's process is :-
(1) 10 (2) 20 (3) 30 (4) 40
50. For an ideal solution, the **correct** option is :-
(1) $\Delta_{mix} S = 0$ at constant T and P
(2) $\Delta_{mix} V \neq 0$ at constant T and P
(3) $\Delta_{mix} H = 0$ at constant T and P
(4) $\Delta_{mix} G = 0$ at constant T and P
51. For a cell involving one electron $E^1_{cell} = 0.59V$ at 298 K, the equilibrium constant for the cell reaction is :-
[Given that $\frac{2.303RT}{F} = 0.059V$ at $T = 298K$]
(1) 1.0×10^2 (2) 1.0×10^5
(3) 1.0×10^{10} (4) 1.0×10^{30}
52. Among the following, the one that is **not** a green house gas is :-
(1) nitrous oxide (2) methane
(3) ozone (4) sulphur dioxide
53. The number of sigma (σ) and pi (π) bonds in pent-2-en-4-yne is :-
(1) 10 σ bonds and 3 π bonds
(2) 8 σ bonds and 5 π bonds
(3) 11 σ bonds and 2 π bonds
(4) 13 σ bonds and no π bond
54. Which of the following diatomic molecular species has only π bonds according to Molecular Orbital Theory ?
(1) O_2 (2) N_2
(3) C_2 (4) Be_2
55. Which of the following reactions are disproportionation reaction ?
(a) $2Cu^+ \rightarrow Cu^{2+} + Cu$
(b) $3MnO_4^{2-} + 4H^+ \rightarrow 2MnO_4^- + MnO_2 + 2H_2O$
(c) $2KMnO_4 \xrightarrow{\Delta} K_2MnO_4 + MnO_2 + O_2$
(d) $2MnO_4^- + 3Mn^{2+} + 2H_2O \rightarrow 5MnO_2 + 4H^+$
Select the **correct** option from the following :-
(1) (a) and (b) only (2) (a), (b) and (c)
(3) (a), (c) and (d) (4) (a) and (d) only
56. Among the following, the narrow spectrum antibiotic is :-
(1) penicillin G (2) ampicillin
(3) amoxycillin (4) chloramphenicol
57. The **correct** order of the basic strength of methyl substituted amines in aqueous solution is:-
(1) $(CH_3)_2NH > CH_3NH_2 > (CH_3)_3N$
(2) $(CH_3)_3N > CH_3NH_2 > (CH_3)_2NH$
(3) $(CH_3)_3N > (CH_3)_2NH > CH_3NH_2$
(4) $CH_3NH_2 > (CH_3)_2NH > (CH_3)_3N$
58. Which mixture of the solutions will lead to the formation of negatively charged colloidal $[AgI]^-$ sol. ?
(1) 50 mL of 1M $AgNO_3$ + 50 mL of 1.5 M KI
(2) 50 mL of 1M $AgNO_3$ + 50 mL of 2 M KI
(3) 50 mL of 2 M $AgNO_3$ + 50 mL of 1.5 M KI
(4) 50 mL of 0.1 M $AgNO_3$ + 50 mL of 0.1 M KI
59. Conjugate base for Bronsted acids H_2O and HF are:-
(1) OH^- and H_2F^+ respectively
(2) H_3O^+ and F^- , respectively
(3) OH^- and F^- , respectively
(4) H_3O^+ and H_2F^+ , respectively
60. Which will make basic buffer ?
(1) 50 mL of 0.1 M NaOH + 25 mL of 0.1 M CH_3COOH
(2) 100 mL of 0.1 M CH_3COOH + 100 mL of 0.1M NaOH
(3) 100 mL of 0.1 M HCl + 200 mL of 0.1 M NH_4OH
(4) 100 mL of 0.1 M HCl + 100 mL of 0.1 M NaOH

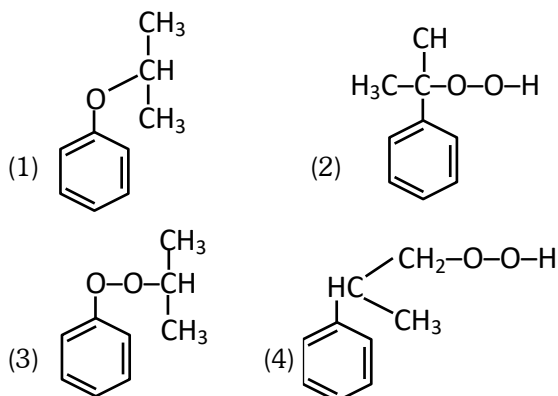
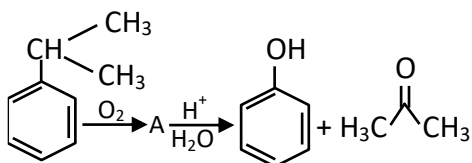
61. The compound that is most difficult to protonate is:-



62. The most suitable reagent for the following conversion is :-



- (1) Na/liquid NH_3
(2) H_2 , Pd/C, quinoline
(3) Zn/HCl
(4) $\text{Hg}^{2+}/\text{H}^+$, H_2O
63. Which of the following species is **not** stable?
- (1) $[\text{SiF}_6]^{2-}$ (2) $[\text{GeCl}_6]^{2-}$
(3) $[\text{Sn}(\text{OH})_6]^{2-}$ (4) $[\text{SiCl}_6]^{2-}$
64. Which of the following is an amphoteric hydroxide?
- (1) $\text{Sr}(\text{OH})_2$
(2) $\text{Ca}(\text{OH})_2$
(3) $\text{Mg}(\text{OH})_2$
(4) $\text{Be}(\text{OH})_2$
65. The structure of intermediate A in the following reaction is :-



66. The manganate and permanganate ions are tetrahedral, due to

- (1) The π -bonding involves overlap of p-orbitals of oxygen with d-orbitals of manganese
(2) There is no π -bonding
(3) The π -bonding involves overlap of p-orbitals of oxygen with p-orbitals of manganese
(4) The π -bonding involves overlap of d-orbitals of oxygen with d-orbitals of manganese

67. For the second period elements the **correct** increasing order of first ionisation enthalpy is :-

- (1) $\text{Li} < \text{Be} < \text{B} < \text{C} < \text{N} < \text{O} < \text{F} < \text{Ne}$
(2) $\text{Li} < \text{B} < \text{Be} < \text{C} < \text{O} < \text{N} < \text{F} < \text{Ne}$
(3) $\text{Li} < \text{B} < \text{Be} < \text{C} < \text{N} < \text{O} < \text{F} < \text{Ne}$
(4) $\text{Li} < \text{Be} < \text{B} < \text{C} < \text{O} < \text{N} < \text{F} < \text{Ne}$

68. If the rate constant for a first order reaction is k, the time (t) required for the completion of 99% of the reaction is given by :-

- (1) $t = 0.693/k$ (2) $t = 6.909/k$
(3) $t = 4.606/k$ (4) $t = 2.303/k$

69. Identify the **incorrect** statement related to PCl_5 from the following :-

- (1) Three equatorial P-Cl bonds make an angle of 120° with each other
(2) Two axial P-Cl bonds make an angle of 180° with each other
(3) Axial P-Cl bonds are longer than equatorial P-Cl bonds
(4) PCl_5 molecule is non-reactive

70. 4d, 5p, 5f and 6p orbitals are arranged in the order of decreasing energy. The **correct** option is :-

- (1) $5f > 6p > 5p > 4d$ (2) $6p > 5f > 5p > 4d$
(3) $6p > 5f > 4d > 5p$ (4) $5f > 6p > 4d > 5p$

71. The biodegradable polymer is :-

- (1) nylon-6,6 (2) nylon 2-nylon 6
(3) nylon-6 (4) Buna-S

72. Match the Xenon compounds in **Column-I** with its structure in **Column-II** and assign the **correct** code:-

Column-I	Column-II
(a) XeF_4	(i) pyramidal
(b) XeF_6	(ii) square planar
(c) XeOF_4	(iii) distorted octahedral
(d) XeO_3	(iv) square pyramidal

Code :

(a)	(b)	(c)	(d)
(1) (i)	(ii)	(iii)	(iv)
(2) (ii)	(iii)	(iv)	(i)
(3) (ii)	(iii)	(i)	(iv)
(4) (iii)	(iv)	(i)	(ii)

73. Which is the **correct** thermal stability order for H_2E ($E=O, S, Se, Te$ and Po) ?

- (1) $H_2S < H_2O < H_2Se < H_2Te < H_2Po$
- (2) $H_2O < H_2S < H_2Se < H_2Te < H_2Po$
- (3) $H_2Po < H_2Te < H_2Se < H_2S < H_2O$
- (4) $H_2Se < H_2Te < H_2Po < H_2O < H_2S$

74. The **correct** structure of tribromooctaoxide is :-

- (1)
- (2)
- (3)
- (4)

75. An alkene "A" on reaction with O_3 and $Zn-H_2O$ gives propanone and ethanal in equimolar ratio. Addition of HCl to alkene "A" gives "B" as the major product. The structure of product "B" is :-

- (1)
- (2)
- (3)
- (4)

76. Enzymes that utilize ATP in phosphate transfer require an alkaline earth metal (M) as the cofactor. M is :

- (1) Be (2) Mg (3) Ca (4) Sr

77. Which one is malachite from the following?

- (1) $CuFeS_2$ (2) $Cu(OH)_2$
- (3) Fe_3O_4 (4) $CuCO_3 \cdot Cu(OH)_2$

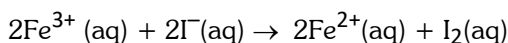
78. Which of the following series of transitions in the spectrum of hydrogen atom falls in visible region?

- (1) Lyman series
- (2) Balmer series
- (3) Paschen series
- (4) Brackett series

79. The mixture that forms maximum boiling azeotrope is :

- (1) Water + Nitric acid
- (2) Ethanol + Water
- (3) Acetone + Carbon disulphide
- (4) Heptane + Octane

80. For the cell reaction



$E_{cell}^{\ominus} = 0.24V$ at 298 K. The standard Gibbs

energy ($\Delta_r G^{\ominus}$) of the cell reaction is :

[Given that Faraday constant $F = 96500 C mol^{-1}$]

- (1) $-46.32 kJ mol^{-1}$
- (2) $-23.16 kJ mol^{-1}$
- (3) $46.32 kJ mol^{-1}$
- (4) $23.16 kJ mol^{-1}$

81. In which case change in entropy is negative?

- (1) Evaporation of water
- (2) Expansion of a gas at constant temperature
- (3) Sublimation of solid to gas
- (4) $2H(g) \rightarrow H_2(g)$

82. Match the following :

- | | |
|----------------------|-----------------------------------|
| (a) Pure nitrogen | (i) Chlorine |
| (b) Haber process | (ii) Sulphuric acid |
| (c) Contact process | (iii) Ammonia |
| (d) Deacon's process | (iv) Sodium azide or Barium azide |

Which of the following is the **correct** option?

- | | (a) | (b) | (c) | (d) |
|-----|-------|-------|-------|-------|
| (1) | (i) | (ii) | (iii) | (iv) |
| (2) | (ii) | (iv) | (i) | (iii) |
| (3) | (iii) | (iv) | (ii) | (i) |
| (4) | (iv) | (iii) | (ii) | (i) |

83. Which of the following is **incorrect** statement ?

- (1) PbF_4 is covalent in nature
- (2) SiCl_4 is easily hydrolysed
- (3) GeX_4 ($\text{X}=\text{F}, \text{Cl}, \text{Br}, \text{I}$) is more stable than GeX_2
- (4) SnF_4 is ionic in nature

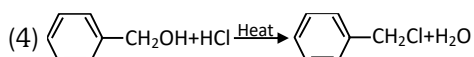
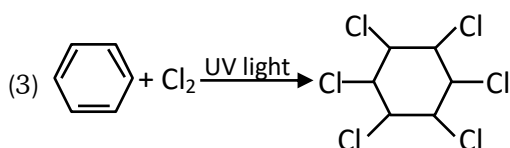
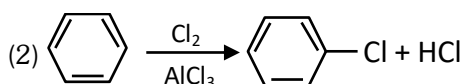
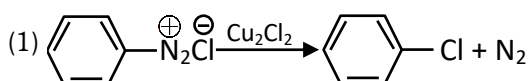
84. The non-essential amino acid among the following is :

- (1) valine
- (2) leucine
- (3) alanine
- (4) lysine

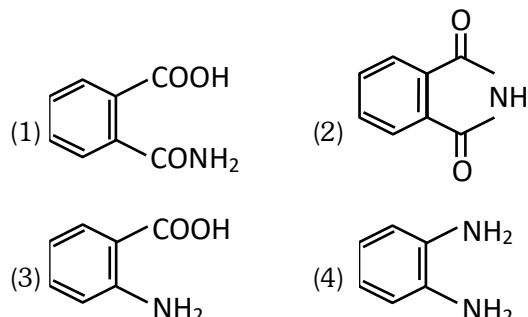
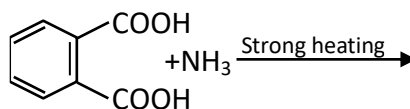
85. A gas at 350 K and 15 bar has molar volume 20 percent smaller than that for an ideal gas under the same conditions. The **correct** option about the gas and its compressibility factor (Z) is :

- (1) $Z > 1$ and attractive forces are dominant
- (2) $Z > 1$ and repulsive forces are dominant
- (3) $Z < 1$ and attractive forces are dominant
- (4) $Z < 1$ and repulsive forces are dominant

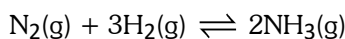
86. Among the following, the reaction that proceeds through an electrophilic substitution is :



87. The major product of the following reaction is :



88. For the chemical reaction



the **correct** option is :

(1) $-\frac{1}{3} \frac{d[\text{H}_2]}{dt} = -\frac{1}{2} \frac{d[\text{NH}_3]}{dt}$

(2) $-\frac{d[\text{N}_2]}{dt} = 2 \frac{d[\text{NH}_3]}{dt}$

(3) $-\frac{d[\text{N}_2]}{dt} = \frac{1}{2} \frac{d[\text{NH}_3]}{dt}$

(4) $3 \frac{d[\text{H}_2]}{dt} = 2 \frac{d[\text{NH}_3]}{dt}$

89. What is the **correct** electronic configuration of the central atom in $\text{K}_4[\text{Fe}(\text{CN})_6]$ based on crystal field theory?

(1) $t_{2g}^4 e_g^2$ (2) $t_{2g}^6 e_g^0$

(3) $e^3 t_2^3$ (4) $e^4 t_2^2$

90. The method used to remove temporary hardness of water is :

- (1) Calgon's method
- (2) Clark's method
- (3) Ion-exchange method
- (4) Synthetic resins method

- 91.** Which of the following statements is **incorrect** ?
 (1) Viroids lack a protein coat
 (2) Viruses are obligate parasites
 (3) Infective constituent in viruses is the protein coat
 (4) Prions consist of abnormally folded proteins
- 92.** Purines found both in DNA and RNA are :-
 (1) Adenine and thymine
 (2) Adenine and guanine
 (3) Guanine and cytosine
 (4) Cytosine and thymine
- 93.** Which of the following glucose transporters is insulin-dependent ?
 (1) GLUT I (2) GLUT II
 (3) GLUT III (4) GLUT IV
- 94.** Identify the cells whose secretion protects the lining of gastro-intestinal tract from various enzymes :-
 (1) Chief Cells
 (2) Goblet Cells
 (3) Oxyntic Cells
 (4) Duodenal Cells
- 95.** Which one of the following equipments is essentially required for growing microbes on a large scale, for industrial production of enzymes ?
 (1) BOD incubator (2) Sludge digester
 (3) Industrial oven (4) Bioreactor
- 96.** Which of the following is **true** for Golden rice ?
 (1) It is Vitamin A enriched, with a gene from daffodil
 (2) It is pest resistant, with a gene from *Bacillus thuringiensis*
 (3) It is drought tolerant, developed using *Agrobacterium* vector
 (4) It has yellow grains, because of a gene introduced from a primitive variety of rice
- 97.** Which one of the following is **not** a method of *in situ* conservation of biodiversity ?
 (1) Biosphere Reserve
 (2) Wildlife Sanctuary
 (3) Botanical Garden
 (4) Sacred Grove
- 98.** Under which of the following conditions will there be no change in the reading frame of following mRNA ?
 5'AACAGCGGUGCUAUU3'
 (1) Insertion of G at 5th position
 (2) Deletion of G from 5th position
 (3) Insertion of A and G at 4th and 5th positions respectively
 (4) Deletion of GGU from 7th, 8th and 9th positions
- 99.** Which of these following methods is the most suitable for disposal of nuclear waste?
 (1) Shoot the waste into space
 (2) Bury the waste under Antarctic ice-cover
 (3) Dump the waste within rocks under deep ocean
 (4) Bury the waste within rocks deep below the Earth's surface
- 100.** Match the following organisms with the products they produce :-
 (a) *Lactobacillus* (i) Cheese
 (b) *Saccharomyces cerevisiae* (ii) Curd
 (c) *Aspergillus niger* (iii) Citric Acid
 (d) *Acetobacter aceti* (iv) Bread
 (v) Acetic Acid
- Select the **correct** option.
- | (a) | (b) | (c) | (d) |
|-----------|------|-------|-------|
| (1) (ii) | (iv) | (v) | (iii) |
| (2) (ii) | (iv) | (iii) | (v) |
| (3) (iii) | (iv) | (v) | (i) |
| (4) (ii) | (i) | (iii) | (v) |
- 101.** What map unit (Centimorgan) is adopted in the construction of genetic maps ?
 (1) A unit of distance between two expressed genes, representing 10% cross over
 (2) A unit of distance between two expressed genes, representing 100% cross over
 (3) A unit of distance between genes on chromosomes, representing 1% cross over
 (4) A unit of distance between genes on chromosomes, representing 50% cross over

- 102.** Select the hormone-releasing Intra-Uterine Devices:-
 (1) Vaults, LNG-20
 (2) Multiload 375, Progestasert
 (3) Progestasert, LNG-20
 (4) Lippes Loop, Multiload 375
- 103.** Which of the following can be used as a biocontrol agent in the treatment of plant disease?
 (1) *Trichoderma* (2) *Chlorella*
 (3) *Anabaena* (4) *Lactobacillus*
- 104.** Expressed Sequence Tags (ESTs) refers to :-
 (1) Genes expressed as RNA
 (2) Polypeptide expression
 (3) DNA polymorphism
 (4) Novel DNA sequences
- 105.** Colostrum, the yellowish fluid, secreted by mother during the initial days of lactation is very essential to impart immunity to the newborn infants because it contains :-
 (1) Natural killer cells (2) Monocytes
 (3) Macrophages (4) Immunoglobulin A
- 106.** Select the **incorrect** statement :-
 (1) Inbreeding increases homozygosity
 (2) Inbreeding is essential to evolve purelines in any animal
 (3) Inbreeding selects harmful recessive genes that reduce fertility and productivity
 (4) Inbreeding helps in accumulation of superior genes and elimination of undesirable genes
- 107.** Select the **correct** sequence of transport of sperm cells in male reproductive system :-
 (1) Testis → Epididymis → Vasa efferentia → Rete testis → Inguinal canal → Urethra
 (2) Seminiferous tubules → Rete testis → Vasa efferentia → Epididymis → Vas deferens → Ejaculatory duct → Urethra → Urethral meatus
 (3) Seminiferous tubules → Vasa efferentia → Epididymis → Inguinal canal → Urethra
 (4) Testis → Epididymis → Vasa efferentia → Vas deferens → Ejaculatory duct → Inguinal canal → Urethra → Urethral meatus
- 108.** A gene locus has two alleles A, a. If the frequency of dominant allele A is 0.4 then what will be the frequency of homozygous dominant, heterozygous and homozygous recessive individuals in the population ?
 (1) 0.36 (AA); 0.48(Aa); 0.16 (aa)
 (2) 0.16 (AA); 0.24 (Aa); 0.36 (aa)
 (3) 0.16 (AA); 0.48 (Aa); 0.36 (aa)
 (4) 0.16 (AA); 0.36 (Aa); 0.48 (aa)
- 109.** Match the following organisms with their respective characteristics :-
 (a) *Pila* (i) Flame cells
 (b) *Bombyx* (ii) Comb plates
 (c) *Pleurobrachia* (iii) Radula
 (d) *Taenia* (iv) Malpighian tubules
 Select the **correct** option from the following :-
- | (a) | (b) | (c) | (d) |
|------------|------|-------|------|
| (1) (iii) | (ii) | (i) | (iv) |
| (2) (iii) | (iv) | (ii) | (i) |
| (3) (ii) | (iv) | (iii) | (i) |
| (4) (iiii) | (ii) | (iv) | (i) |
- 110.** The shorter and longer arms of a submetacentric chromosome are referred to as :-
 (1) s-arm and l-arm respectively
 (2) p-arm and q-arm respectively
 (3) q-arm and p-arm respectively
 (4) m-arm and n-arm respectively
- 111.** What is the site of perception of photoperiod necessary for induction of flowering in plants ?
 (1) Lateral buds (2) Pulvinus
 (3) Shoot apex (4) Leaves
- 112.** Which part of the brain is responsible for thermoregulation ?
 (1) Cerebrum
 (2) Hypothalamus
 (3) Corpus callosum
 (4) Medulla oblongata
- 113.** Which of the following pair of organelles does not contain DNA :-
 (1) Mitochondria and Lysosomes
 (2) Chloroplast and Vacuoles
 (3) Lysosomes and Vacuoles
 (4) Nuclear envelope and Mitochondria
- 114.** What is the genetic disorder in which an individual has an overall masculine development, gynaecomastia, and is sterile?
 (1) Turner's syndrome
 (2) Klinefelter's syndrome
 (3) Edward syndrome
 (4) Down's syndrome

- 115.** Xylem translocates :-
 (1) Water only
 (2) Water and mineral salts only
 (3) Water, mineral salts and some organic nitrogen only
 (4) Water, mineral salts, some organic nitrogen and hormones
- 116.** Which of the following pairs of gases is mainly responsible for green house effect?
 (1) Ozone and Ammonia
 (2) Oxygen and Nitrogen
 (3) Nitrogen and Sulphur dioxide
 (4) Carbon dioxide and Methane
- 117.** Which of the following protocols did aim for reducing emission of chlorofluorocarbons into the atmosphere?
 (1) Montreal protocol
 (2) Kyoto protocol
 (3) Gothenburg Protocol
 (4) Geneva Protocol
- 118.** In some plants, the female gamete develops into embryo without fertilization. This phenomenon is known as :
 (1) Autogamy
 (2) Parthenocarpy
 (3) Syngamy
 (4) Parthenogenesis
- 119.** Which of the following sexually transmitted diseases is **not** completely curable ?
 (1) Gonorrhoea (2) Genital warts
 (3) Genital herpes (4) Chlamydia
- 120.** Which of the following immune responses is responsible for rejection of kidney graft?
 (1) Auto- immune responses
 (2) Humoral immune response
 (3) Inflammatory immune response
 (4) Cell-mediated immune response
- 121.** Which of the following factors is responsible for the formation of concentrated urine?
 (1) Low levels of antidiuretic hormone
 (2) Maintaining hyperosmolarity towards inner medullary interstitium in the kidneys.
 (3) Secretion of erythropoietin by juxtaglomerular complex.
 (4) Hydrostatic pressure during glomerular filtration.
- 122.** Which of the following features of genetic code does allow bacteria to produce human insulin by recombinant DNA technology?
 (1) Genetic code is not ambiguous
 (2) Genetic code is redundant
 (3) Genetic code is nearly universal
 (4) Genetic code is specific
- 123.** Which of the following statement is **not** correct?
 (1) Lysosomes have numerous hydrolytic enzymes.
 (2) The hydrolytic enzymes of lysosomes are active under acidic pH.
 (3) Lysosomes are membrane bound structures.
 (4) Lysosomes are formed by the process of packaging in the endoplasmic reticulum.
- 124.** The concept of "*Omnis cellula-e cellula*" regarding cell division was first proposed by:
 (1) Rudolf Virchow
 (2) Theodore Schwann
 (3) Schleiden
 (4) Aristotle
- 125.** Use of an artificial kidney during hemodialysis may result in :
 (a) Nitrogenous waste build-up in the body
 (b) Non-elimination of excess potassium ions
 (c) Reduced absorption of calcium ions from gastro-intestinal tract
 (d) Reduced RBC production
 Which of the following options is the most **appropriate**?
 (1) (a) and (b) are correct
 (2) (b) and (c) are correct
 (3) (c) and (d) are correct
 (4) (a) and (d) are correct
- 126.** What is the direction of movement of sugars in phloem?
 (1) Non-multidirectional
 (2) Upward
 (3) Downward
 (4) Bi-directional
- 127.** Which of the following muscular disorders is inherited ?
 (1) Tetany
 (2) Muscular dystrophy
 (3) Myasthenia gravis
 (4) Botulism

128. Consider following features:

- (a) Organ system level of organisation
- (b) Bilateral symmetry
- (c) True coelomates with segmentation of body

Select the **correct** option of animal groups which possess all the above characteristics.

- (1) Annelida, Arthropoda and Chordata
- (2) Annelida, Arthropoda and Mollusca
- (3) Arthropoda, Mollusca and Chordata
- (4) Annelida, Mollusca and Chordata

129. The frequency of recombination between gene pairs on the same chromosome as a measure of the distance between genes was explained by :

- (1) T.H. Morgan
- (2) Gregor J. Mendel
- (3) Alfred Sturtevant
- (4) Sutton Boveri

130. Following statements describe the characteristics of the enzyme Restriction endonuclease. Identify the **incorrect** statement.

- (1) The enzyme cuts DNA molecule at identified position within the DNA
- (2) The enzyme binds DNA at specific sites and cuts only one of the two strands.
- (3) The enzyme cuts the sugar-phosphate backbone at specific sites on each strand.
- (4) The enzyme recognizes a specific palindromic nucleotide sequence in the DNA

131. Which of the following statements is **incorrect**?

- (1) Morels and truffles are edible delicacies.
- (2) *Claviceps* is a source of many alkaloids and LSD.
- (3) Conidia are produced exogenously and ascospores endogenously.
- (4) Yeasts have filamentous bodies with long thread-like hyphae.

132. Placentation, in which ovules develop on the inner wall of the ovary or in peripheral part, is :

- (1) Basal
- (2) Axile
- (3) Parietal
- (4) Free central

133. Which of the following is the most important causes for animals and plants being driven to extinction?

- (1) Habitat loss and fragmentation
- (2) Drought and floods
- (3) Economic exploitation
- (4) Alien species invasion

134. Variations caused by mutation, as proposed by Hugo de Vries, are

- (1) random and directional
- (2) random and directionless
- (3) small and directional
- (4) small and directionless

135. Respiratory Quotient (RQ) value of tripalmitin is:

- (1) 0.9
- (2) 0.7
- (3) 0.07
- (4) 0.09

136. In *Antirrhinum* (Snapdragon), a red flower was crossed with a white flower and in F_1 generation, pink flowers were obtained. When pink flowers were selfed, the F_2 generation showed white, red and pink flowers. Choose the incorrect statement from the following :

- (1) This experiment does not follow the Principle of Dominance
- (2) Pink colour in F_1 is due to incomplete dominance.
- (3) Ratio of F_2 is $\frac{1}{4}$ (Red) : $\frac{2}{4}$ (Pink) : $\frac{1}{4}$ (White)
- (4) Law of Segregation does not apply in this experiment.

137. Select the **incorrect** statement.

- (1) Male fruit fly is heterogametic.
- (2) In male grasshoppers, 50% of sperms have no sex-chromosome.
- (3) In domesticated fowls sex of progeny depends on the type of sperm rather than egg.
- (4) Human males have one of their sex-chromosome much shorter than the other.

138. The **correct** sequence of phases of cell cycle is :

- (1) $M \rightarrow G_1 \rightarrow G_2 \rightarrow S$
- (2) $G_1 \rightarrow G_2 \rightarrow S \rightarrow M$
- (3) $S \rightarrow G_1 \rightarrow G_2 \rightarrow M$
- (4) $G_1 \rightarrow S \rightarrow G_2 \rightarrow M$

- 139.** *Thiobacillus* is a group of bacteria helpful in carrying out :
- (1) Nitrogen fixation
 - (2) Chemoautotrophic fixation
 - (3) Nitrification
 - (4) Denitrification
- 140.** Polyblend, a fine powder of recycled modified plastic, has proved to be a good material for:
- (1) making plastic sacks
 - (2) use as a fertilizer
 - (3) construction of roads
 - (4) making tubes and pipes
- 141.** From evolutionary point of view, retention of the female gametophyte with developing young embryo on the parent sporophyte for some time, is first observed in :
- (1) Liverworts
 - (2) Mosses
 - (3) Pteridophytes
 - (4) Gymnosperms
- 142.** Select the **correct** option .
- (1) 8th, 9th and 10th pairs of ribs articulate directly with the sternum.
 - (2) 11th and 12th pairs of ribs are connected to the sternum with the help of hyaline cartilage.
 - (3) Each rib is a flat thin bone and all the ribs are connected dorsally to the thoracic vertebrae and ventrally to the sternum.
 - (4) There are seven pairs of vertebrosteral, three pairs of vertebrochondral and two pairs of vertebral ribs.
- 143.** Concanavalin A is :
- (1) an alkaloid
 - (2) an essential oil
 - (3) a lectin
 - (4) a pigment
- 144.** Extrusion of second polar body from egg nucleus occurs :
- (1) after entry of sperm but before fertilization
 - (2) after fertilization
 - (3) before entry of sperm into ovum
 - (4) simultaneously with first cleavage
- 145.** Pinus seed **cannot** germinate and establish without fungal association. This is because :
- (1) its embryo is immature
 - (2) it has obligate association with mycorrhizae.
 - (3) it has very hard seed coat.
 - (4) its seeds contain inhibitors that prevent germination .
- 146.** The Earth Summit held in Rio de Janeiro in 1992 was called :
- (1) to reduce CO₂ emissions and global warming.
 - (2) for conservation of biodiversity and sustainable utilization of its benefits.
 - (3) to assess threat posed to native species by invasive weed species.
 - (4) for immediate steps to discontinue use of CFCs that were damaging the ozone layer.
- 147.** DNA precipitation out of a mixture of biomolecules can be achieved by treatment with :
- (1) Isopropanol
 - (2) Chilled ethanol
 - (3) Methanol at room temperature
 - (4) Chilled chloroform
- 148.** Grass leaves curl inwards during very dry weather. Select the most appropriate reason from the following :
- (1) Closure of stomata
 - (2) Flaccidity of bulliform cells
 - (3) Shrinkage of air spaces in spongy mesophyll
 - (4) Tyloses in vessels

149. Match the following structures with their respective location in organs :

- | | |
|--------------------------|-----------------------|
| (a) Crypts of Lieberkuhn | (i) Pancreas |
| (b) Glisson's Capsule | (ii) Duodenum |
| (c) Islets of Langerhans | (iii) Small intestine |
| (d) Brunner's Glands | (iv) Liver |

Select the **correct** option from the following :

- | | (a) | (b) | (c) | (d) |
|-----|-------|------|------|-------|
| (1) | (iii) | (i) | (ii) | (iv) |
| (2) | (ii) | (iv) | (i) | (iii) |
| (3) | (iii) | (iv) | (i) | (ii) |
| (4) | (iii) | (ii) | (i) | (iv) |

150. Match the following hormones with the respective disease :

- | | |
|--------------------|-------------------------|
| (a) Insulin | (i) Addison's disease |
| (b) Thyroxin | (ii) Diabetes insipidus |
| (c) Corticoids | (iii) Arcomegaly |
| (d) Growth Hormone | (iv) Goitre |
| | (v) Diabetes mellitus |

Select the **correct** option.

- | | (a) | (b) | (c) | (d) |
|-----|------|------|-------|-------|
| (1) | (v) | (i) | (ii) | (iii) |
| (2) | (ii) | (iv) | (iii) | (i) |
| (3) | (v) | (iv) | (i) | (iii) |
| (4) | (ii) | (iv) | (i) | (iii) |

151. Which of the following contraceptive methods do involve a role of hormone ?

- (1) Lactational amenorrhea, Pills, Emergency contraceptives
- (2) Barrier method, Lactational amenorrhea, Pills
- (3) CuT, Pills, Emergency contraceptives
- (4) Pills, Emergency contraceptives, Barrier methods

152. Drug called 'Heroin' is synthesized by :

- (1) methylation of morphine
- (2) acetylation of morphine
- (3) glycosylation of morphine
- (4) nitration of morphine

153. In a species, the weight of newborn ranges from 2 to 5 kg. 97% of the newborn with an average weight between 3 to 3.3kg survive whereas 99% of the infants born with weights from 2 to 2.5 kg or 4.5 to 5 kg die. Which type of selection process is taking place ?

- (1) Directional Selection
- (2) Stabilizing Selection
- (3) Disruptive Selection
- (4) Cyclical Selection

154. Conversion of glucose to glucose-6-phosphate, the first irreversible reaction of glycolysis, is catalyzed by :

- (1) Aldolase
- (2) Hexokinase
- (3) Enolase
- (4) Phosphofructokinase

155. Which of the following statements is **correct** ?

- (1) Cornea is an external, transparent and protective proteinaceous covering of the eye-ball.
- (2) Cornea consists of dense connective tissue of elastin and can repair itself.
- (3) Cornea is convex, transparent layer which is highly vascularised.
- (4) Cornea consists of dense matrix of collagen and is the most sensitive portion of the eye.

156. Which of the following ecological pyramids is generally inverted ?

- (1) Pyramid of numbers in grassland
- (2) Pyramid of energy
- (3) Pyramid of biomass in a forest
- (4) Pyramid of biomass in a sea

157. Consider the following statements :

(A) Coenzyme or metal ion that is tightly bound to enzyme protein is called prosthetic group.

(B) A complete catalytic active enzyme with its bound prosthetic group is called apoenzyme.

Select the **correct** option.

(1) Both (A) and (B) are true.

(2) (A) is true and (B) is false.

(3) Both (A) and (B) are false.

(4) (A) is false and (B) is true.

158. Due to increasing air-borne allergens and pollutants, many people in urban areas are suffering from respiratory disorder causing wheezing due to :

(1) benign growth on mucous lining of nasal cavity.

(2) inflammation of bronchi and bronchioles.

(3) proliferation of fibrous tissues and damage of the alveolar walls.

(4) reduction in the secretion of surfactants by pneumocytes.

159. Which one of the following statements regarding post-fertilization development in flowering plants is **incorrect** ?

(1) Ovary develops into fruit

(2) Zygote develops into embryo

(3) Central cell develops into endosperm

(4) Ovules develop into embryo sac

160. Phloem in gymnosperms lacks :

(1) Albuminous cells and sieve cells

(2) Sieve tubes only

(3) Companion cells only

(4) Both sieve tubes and companion cells

161. It takes very long time for pineapple plants to produce flowers. Which combination of hormones can be applied to artificially induce flowering in pineapple plants throughout the year to increase yield?

(1) Auxin and Ethylene

(2) Gibberellin and Cytokinin

(3) Gibberellin and Absciscic acid

(4) Cytokinin and Absciscic acid

162. Persistent nucellus in the seed is known as :

(1) Chalaza

(2) Perisperm

(3) Hilum

(4) Tegmen

163. Cells in G_0 phase:

(1) exit the cell cycle

(2) enter the cell cycle

(3) suspend the cell cycle

(4) terminate the cell cycle

164. Match **Column - I** with **Column - II**.

Column - I

Column - II

(a) Saprophyte (i) Symbiotic association of fungi with plant roots

(b) Parasite (ii) Decomposition of dead organic materials

(c) Lichens (iii) Living on living plants or animals

(d) Mycorrhiza (iv) Symbiotic association of algae and fungi

Choose the **correct** answer from the options given below :

(a)	(b)	(c)	(d)
(1) (i)	(ii)	(iii)	(iv)
(2) (iii)	(ii)	(i)	(iv)
(3) (ii)	(i)	(iii)	(iv)
(4) (ii)	(iii)	(iv)	(i)

165. What would be the heart rate of a person if the cardiac output is 5L, blood volume in the ventricles at the end of diastole is 100 mL and at the end of ventricular systole is 50 mL?

(1) 50 beats per minute

(2) 75 beats per minute

(3) 100 beats per minute

(4) 125 beats per minute

166. What triggers activation of protoxin to active Bt toxin of *Bacillus thuringiensis* in boll worm?

(1) Body temperature

(2) Moist surface of midgut

(3) Alkaline pH of gut

(4) Acidic pH of stomach

167. The ciliated epithelial cells are required to move particles or mucus in a specific direction. In humans, these cells are mainly present in :

- (1) Bile duct and Bronchioles
- (2) Fallopian tubes and Pancreatic duct
- (3) Eustachian tube and Salivary duct
- (4) Bronchioles and Fallopian tubes

168. Which of the statements given below is **not** true about formation of Annual Rings in trees?

- (1) Annual ring is a combination of spring wood and autumn wood produced in a year.
- (2) Differential activity of cambium causes light and dark bands of tissue - early and late wood respectively
- (3) Activity of cambium depends upon variation in climate.
- (4) Annual rings are not prominent in trees of temperate region.

169. What is the fate of the male gametes discharged in the synergid?

- (1) One fuses with the egg, other(s) degenerate(s) in the synergid.
- (2) All fuse with the egg.
- (3) One fuses with the egg, other(s) fuse(s) with synergid nucleus.
- (4) One fuses with the egg and other fuses with central cell nuclei.

170. Match the following genes of the Lac operon with their respective products :-

- | | |
|------------|----------------------------|
| (a) i gene | (i) β -galactosidase |
| (b) z gene | (ii) Permease |
| (c) a gene | (iii) Repressor |
| (d) y gene | (iv) Transacetylase |

Select the **correct** option.

- | (a) | (b) | (c) | (d) |
|-----------|-------|------|------|
| (1) (i) | (iii) | (ii) | (iv) |
| (2) (iii) | (i) | (ii) | (iv) |
| (3) (iii) | (i) | (iv) | (ii) |
| (4) (iii) | (iv) | (i) | (ii) |

171. Select the correct sequence of organs in the alimentary canal of cockroach starting from mouth:

- (1) Pharynx \rightarrow Oesophagus \rightarrow Crop \rightarrow Gizzard \rightarrow Ileum \rightarrow Colon \rightarrow Rectum
- (2) Pharynx \rightarrow Oesophagus \rightarrow Gizzard \rightarrow Crop \rightarrow Ileum \rightarrow Colon \rightarrow Rectum
- (3) Pharynx \rightarrow Oesophagus \rightarrow Gizzard \rightarrow Ileum \rightarrow Crop \rightarrow Colon \rightarrow Rectum
- (4) Pharynx \rightarrow Oesophagus \rightarrow Ileum \rightarrow Crop \rightarrow Gizzard \rightarrow Colon \rightarrow Rectum

172. Match the hominids with their correct brain size :

- | | |
|----------------------------------|------------------|
| (a) <i>Homo habilis</i> | (i) 900 cc |
| (b) <i>Homo neanderthalensis</i> | (ii) 1350 cc |
| (c) <i>Homo erectus</i> | (iii) 650-800 cc |
| (d) <i>Homo sapiens</i> | (iv) 1400 cc |

Select the **correct** option.

- | (a) | (b) | (c) | (d) |
|-----------|-------|------|------|
| (1) (iii) | (i) | (iv) | (ii) |
| (2) (iii) | (ii) | (i) | (iv) |
| (3) (iii) | (iv) | (i) | (ii) |
| (4) (iv) | (iii) | (i) | (ii) |

173. Identify the **correct** pair representing the causative agent of typhoid fever and the confirmatory test for typhoid.

- (1) *Plasmodium vivax*/UTI test.
- (2) *Streptococcus pneumoniae*/Widal test
- (3) *Salmonella typhi*/Anthrone test
- (4) *Salmonella typhi*/Widal test

174. How does steroid hormone influence the cellular activities?

- (1) Changing the permeability of the cell membrane.
- (2) Binding to DNA and forming a gene-hormone complex.
- (3) Activating cyclic AMP located on the cell membrane.
- (4) Using aquaporin channels as second messenger.

175. Tidal Volume and Expiratory Reserve Volume of an athlete is 500 mL and 1000 mL respectively. What will be his Expiratory Capacity if the Residual Volume is 1200 mL?

- (1) 1500 mL
- (2) 1700 mL
- (3) 2200 mL
- (4) 2700 mL

176. Which of the following is a commercial blood cholesterol lowering agent?

- (1) Cyclosporin A
- (2) statin
- (3) Streptokinase
- (4) Lipases

177. Which of the following statements regarding mitochondria is **incorrect**?

- (1) Outer membrane is permeable to monomers of carbohydrates fats and proteins.
- (2) Enzymes of electron transport are embedded in outer membrane.
- (3) Inner membrane is convoluted with infoldings.
- (4) Mitochondrial matrix contains single circular DNA molecule and ribosomes.

178. Match the **Column - I** with **Column -II**

Column - I	Column - II
(a) P-wave	(i) Depolarisation of ventricles
(b) QRS complex	(ii) Repolarisation of ventricles
(c) T-wave	(iii) Coronary ischemia
(d) Reduction in the size of T-wave	(iv) Depolarisation of atria
	(v) Repolarisation of atria

Select the **correct** option-

(a)	(b)	(c)	(d)
(1) (iv)	(i)	(ii)	(iii)
(2) (iv)	(i)	(ii)	(v)
(3) (ii)	(i)	(v)	(iii)
(4) (ii)	(iii)	(v)	(iv)

179. Select the **correct** group of biocontrol agents.

- (1) *Bacillus thuringiensis*, Tobacco mosaic virus, Aphids
- (2) *Trichoderma*, *Baculovirus*, *Bacillus thuringiensis*
- (3) *Oscillatoria*, *Rhizobium*, *Trichoderma*
- (4) *Nostoc*, *Azospirillum*, *Nucleopolyhedrovirus*

180. Select **correctly** written scientific name of Mango which was first described by Carolus Linnaeus:

- (1) *Mangifera indica* Car. Linn.
- (2) *Mangifera indica* Linn.
- (3) *Mangifera indica*
- (4) *Mangifera Indica*

ANSWER KEY

NEET(UG)-2019

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	2	2	3	3	3	2	1	3	2	4	4	3	4	4	3
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	1	2	4	1	1	4	2	4	2	3	3	3	3	4	2
Que.	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Ans.	4	3	2	4	2	3	1	2	3	1	2	1	3	3	2
Que.	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ans.	1	3	1	3	3	3	4	1	3	1	1	1	1,2	3	3
Que.	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Ans.	4	2	4	4	2	1	2	3	4	1	2	2	3	1	3
Que.	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
Ans.	2	4	2	1	1	4	4	1	3	3	2	2	3	2	2
Que.	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105
Ans.	3	2	4	2	4	1	3	4	4	2	3	3	1	1	4
Que.	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
Ans.	3	2	3	2	2	4	2	3	2	4	4	1	4	3	4
Que.	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135
Ans.	2	3	4	1	3	4	2	1	3	2	4	3	1	2	2
Que.	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
Ans.	4	3	4	4	3	3	4	3	1	2	2	2	2	3	3
Que.	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165
Ans.	1	2	2	2	4	4	2	2	4	4	1	2	3	4	3
Que.	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
Ans.	3	4	4	4	3	1	3	4	2	1	2	2	1	2	2

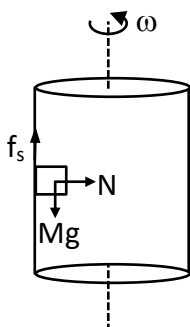
HINT - SHEET

- Adiabatic process
 $\Delta Q = 0$
- $KE \propto \text{Temperature}$
As temperature increases KE also increases
- $TE = -3.4 \text{ eV}$
 $KE = -T.E$
 $\Rightarrow KE = +3.4 \text{ eV}$
 $PE = 2T.E$
 $\Rightarrow PE = -6.8 \text{ eV}$

A	B	Y
0	0	1
0	1	1
1	0	1
1	1	0

\therefore It is a NAND Gate

- $f_L = \mu N = \mu m r \omega^2$
 $f_s = mg$
As $f_s \leq f_L$
 $\Rightarrow mg \leq \mu m r \omega^2$
 $\Rightarrow \omega \geq \sqrt{\frac{g}{\mu r}}$
 $\Rightarrow \omega_{\min} = 10 \text{ rad/s}$



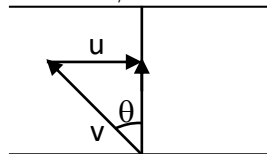
- A $(4m) \rightarrow u$ B $(2m)$ rest $(4m) \rightarrow v_1$ $(2m) \rightarrow v_2$

$$v_1 = \frac{4m - 2m}{4m + 2m} u = \frac{2mu}{6m} = \frac{u}{3}$$

Fraction of energy lost

$$= \frac{\frac{1}{2}(4m)u^2 - \frac{1}{2}(4m)\left(\frac{u}{3}\right)^2}{\frac{1}{2}(4m)u^2} = 1 - \frac{1}{9} = \frac{8}{9}$$

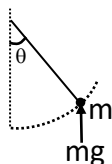
- $v = 20 \text{ m/s}$
 $u = 10 \text{ m/s}$



$$\sin \theta = \frac{u}{v} = \frac{10}{20} = \frac{1}{2}$$

$$\Rightarrow \theta = 30^\circ \text{ west}$$

8. $T - mg \cos \theta = \frac{mv^2}{R}$



T will be maximum when $\theta = 0^\circ$,

When mass is at lowest point.

9. $y = A_0 + A \sin \omega t + B \cos \omega t$

$$y = A_0 + \sqrt{A^2 + B^2} \sin(\omega t + \phi)$$

A_0 is mean position, and $\sqrt{A^2 + B^2}$ is amplitude

10. Given

$$N = 800, A = 0.05 \text{ m}^2, B = 5 \times 10^{-5} \text{ T}$$

$$\Delta t = 0.15 \text{ s}$$

$$\begin{aligned} \text{As } e &= -\frac{(\phi_f - \phi_i)}{\Delta t} = -\frac{(0 - NBA)}{\Delta t} \\ &= \frac{800 \times 5 \times 10^{-5} \times 5 \times 10^{-2}}{0.1} = 0.02 \text{ V} \end{aligned}$$

11. Displacement = zero in one complete oscillation

$$\Rightarrow \text{Average velocity} = \frac{\text{Displacement}}{T} = 0$$

12. $P = P_0 + \rho g Z_0$ (i)

Also, $P = P_0 + \frac{4T}{R}$ (ii)

From (i) & (ii)

$$\rho g Z_0 = \frac{4T}{R}$$

$$\begin{aligned} \therefore Z_0 &= \frac{4T}{\rho g R} = \frac{4 \times 2.5 \times 10^{-2}}{10^3 \times 10 \times 10^{-3}} \\ &= 10^{-2} \text{ m} = 1 \text{ cm} \end{aligned}$$

13. At any temperature

$$(\Delta \ell)_{\text{Cu}} = (\Delta \ell)_{\text{Al}}$$

$$\ell_1 \alpha_1 \Delta T = \ell_2 \alpha_2 \Delta T$$

$$88 \times 1.7 \times 10^{-5} = \ell_2 \times 2.2 \times 10^{-5}$$

$$\ell_2 = 68 \text{ cm}$$

14. $\frac{dQ}{dt} = -(K)A \frac{dT}{dx}$

$$\frac{J}{s} = (K)m^2 \frac{\text{kelvin}}{\text{m}}$$

$$(K) = \text{watt m}^{-1} \text{ K}^{-1}$$

15. $U = \frac{1}{2} (\text{force})(\text{elongation})$

$$= \frac{1}{2} (Mg)\ell = \frac{1}{2} Mg\ell$$

16. $W_{\text{all}} = \Delta KE$

$$\Rightarrow W = 0 - \frac{1}{2} mv_{\text{cm}}^2 \left(1 + \frac{K^2}{R^2} \right)$$

$$\Rightarrow W = -3J$$

17. $x = \frac{A^2 B^{1/2}}{C^{1/3} D^3}$

$$\frac{\Delta x}{x} = \frac{2\Delta A}{A} + \frac{1}{2} \frac{\Delta B}{B} + \frac{1}{3} \frac{\Delta C}{C} + 3 \frac{\Delta D}{D}$$

$$\begin{aligned} \Rightarrow \frac{\Delta x}{x} \times 100 &= 2(1\%) + \frac{1}{2}(2\%) + \frac{1}{3}(3\%) + 3(4\%) \\ &= 16\% \end{aligned}$$

18. $g' = g \left(1 - \frac{d}{R} \right)$

$$g' = g \left(1 - \frac{R/2}{R} \right)$$

$$mg' = mg \left(\frac{1}{2} \right)$$

$$W' = 200 \left(\frac{1}{2} \right) = 100 \text{ N}$$

19. Longest wavelength is of red colour.

20. $\theta = 2\pi \times 2\pi \text{ radian}$

$$\omega_0 = 3 \text{ rpm} \Rightarrow \frac{2\pi}{60} (3) \frac{\text{rad}}{\text{sec}}$$

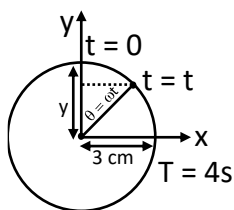
$$\omega^2 = \omega_0^2 - 2\alpha\theta$$

$$0 = \left(\frac{3 \times 2\pi}{60} \right)^2 - 2\alpha(4\pi^2)$$

$$\therefore \alpha = \frac{1}{800} \text{ rad/s}^2$$

$$\tau = \frac{mR^2}{2} \alpha = \frac{2}{2} \times \left(\frac{4}{100} \right)^2 \times \frac{1}{800} = 2 \times 10^{-6} \text{ Nm}$$

21.



$$\omega = \frac{2\pi}{4} = \frac{\pi}{2}$$

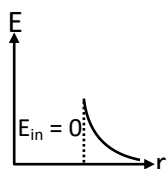
For y-projection,

$$y = A \cos \omega t$$

$$\Rightarrow y = 3 \cos \left(\frac{\pi t}{2} \right)$$

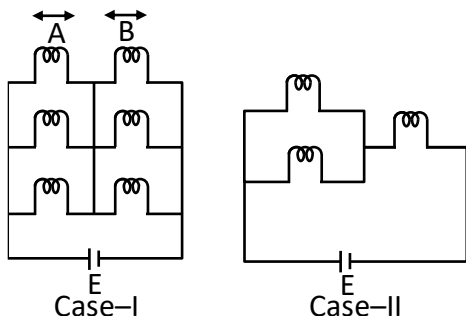
22.

For a metal sphere $E_{in} = 0$ and $\vec{E}_{out} = \frac{Kq}{r^2} \hat{r}$.



23.

Eddy current effect is not used in electric heater.



24.

$$R_{eq1} = 2R/3$$

$$R_{eq2} = R/2 + R = \frac{3R}{2}$$

$$P_{eq1} = \frac{E^2}{2R/3} = \frac{3P}{2}$$

$$P_{eq2} = \frac{E^2}{3R/2} = \frac{2P}{3}$$

$$\therefore P_{eq1} : P_{eq2} = 9 : 4$$

25.

In northern hemisphere dip is +ve and in southern hemisphere dip is -ve.

26.

$$W = \int_{y_1}^{y_2} F dy$$

$$\Rightarrow W = \int_0^1 (20 + 10y) dy$$

$$\Rightarrow W = 20[y]_0^1 + 10\left[\frac{y^2}{2}\right]_0^1$$

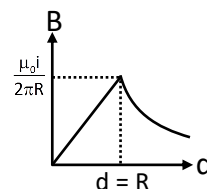
$$\Rightarrow W = 25 \text{ J}$$

27.

An observer can see a rainbow when his back is towards the sun.

28.

$$B = \begin{cases} \frac{\mu_0 i d}{2\pi R^2} & : d \leq R \\ \frac{\mu_0 i}{2\pi d} & : d > R \end{cases}$$



29.

$$T_A = T_B$$

$$\Rightarrow \frac{2\pi}{\omega_A} = \frac{2\pi}{\omega_B}$$

$$\Rightarrow \frac{\omega_A}{\omega_B} = 1 : 1$$

30.

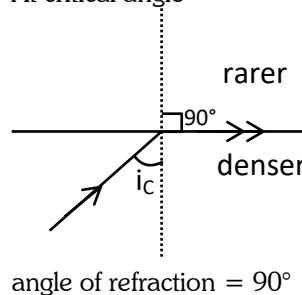
$$\frac{1}{F_1} = \frac{1}{f} + \frac{1}{f} \Rightarrow F_1 = f/2$$

$$\text{and } F_2 = f$$

$$\Rightarrow \frac{F_1}{F_2} = \frac{1}{2}$$

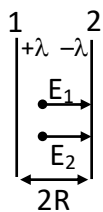
31.

At critical angle



angle of refraction = 90°

32. $\vec{E} = \vec{E}_1 + \vec{E}_2$
 $E = E_1 + E_2$



$$E = \frac{\lambda}{2\pi\epsilon_0 R} + \frac{\lambda}{2\pi\epsilon_0 R}$$

$$E = \frac{\lambda}{\pi\epsilon_0 R} \text{ N/C}$$

33. For P type

Holes are majority & trivalent atoms are the dopants.

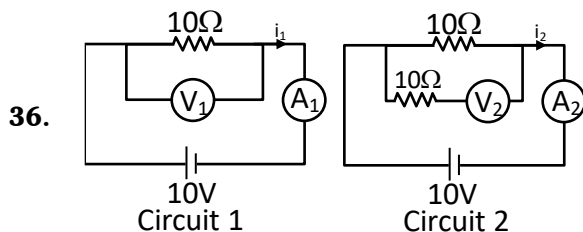
34. Fuse is used for protection.

35. $V = \frac{Q}{C}$

or $Q = CV$

$$\therefore i = C \frac{dV}{dt} = 20 \mu\text{F} \times 3\text{V/s} = 60 \mu\text{A}$$

Also, conduction current in wires is equal to displacement current between the plates of capacitor.



10Ω is in series with ideal voltmeter. Therefore it will not affect the circuit (Circuit-2)

$$i_1 = \frac{10}{10} = 1\text{A} \quad i_2 = \frac{10}{10} = 1\text{A}$$

$$V_1 = 10\text{V} \quad V_2 = 10\text{V}$$

37. $\alpha = {}^4_2\text{He}^{2+} = \text{Helium Nuclei}$

2 protons and 2 neutrons

38. $\lambda = \sqrt{\frac{150}{V}} \text{ \AA}$

$$\lambda = \sqrt{\frac{150}{10^4}} \text{ \AA} = 12.27 \times 10^{-12} \text{ m}$$

39. $v^2 = u^2 - 2as$

$$\Rightarrow s = \frac{u^2}{2a} = \frac{u^2}{2g \sin \theta}$$

$$\Rightarrow \frac{x_1}{x_2} = \frac{\sin \theta_2}{\sin \theta_1} = \frac{\sin 30^\circ}{\sin 60^\circ} = \frac{1/2}{\sqrt{3}/2}$$

$$\Rightarrow \frac{x_1}{x_2} = \frac{1}{\sqrt{3}}$$

40. velocity of efflux $v = \sqrt{2gh}$

$$\text{volume flow rate} = Av = A\sqrt{2gh}$$

$$= (2 \times 10^{-6}) (2 \times 10 \times 2)^{1/2}$$

$$= 4\sqrt{10} \times 10^{-6} \text{ m}^3/\text{s}$$

$$\cong 12.6 \times 10^{-6} \text{ m}^3/\text{s}$$

41. $\frac{q}{A} \xrightarrow{r} \frac{-q}{B} \quad F = \frac{-Kq^2}{r^2}$
 25% charge from A is transferred to B

$$\frac{3q}{4} \xrightarrow{r} \frac{-q + \frac{q}{4}}{B} = \frac{-3q}{4}$$

New force (F')

$$= \frac{K \left(\frac{3q}{4} \right) \left(\frac{-3q}{4} \right)}{r^2} = \frac{-9Kq^2}{16r^2} = \frac{9F}{16}$$

42. $\frac{q_H}{q_\alpha} = \frac{1}{2}$

$$r = \frac{mv}{qB}$$

For same momenta, $r \propto \frac{1}{q}$

$$\frac{r_H}{r_\alpha} = \frac{q_\alpha}{q_H} = \frac{2}{1}$$

43. $\vec{F}_{\text{net}} = \vec{F}_1 + \vec{F}_2 + \vec{F}_3 = \vec{0}$

$$\Rightarrow \vec{a} = 0$$

$$\Rightarrow \vec{v} = \text{constant}$$

44. $W = \frac{mgh}{1 + h/R}$

$$\text{at } h = R, W = \frac{mgR}{2}$$

45. $\theta' = \theta/\mu$

$$\therefore \theta' = \frac{0.2^\circ}{4/3} = 0.15^\circ$$

46. $W = -P_{\text{ext}}(V_2 - V_1)$
 $P_{\text{ext}} = 2 \text{ bar}$
 $V_1 = 0.1 \text{ L}$
 $V_2 = 0.25 \text{ L}$
 $W = -2 \text{ bar}[0.25 - 0.1] \text{ L}$
 $W = -2 \times 0.15 \text{ bar L}$
 $W = -0.30 \text{ bar L}$
 $W = (-0.30) \times 100 = -30 \text{ J}$
Hence work done by gas is 30 J
47. Anion A in HCP
No of ions of A in Unit cell = 6
No of Octahedral voids = 6
75% is occupied by cations C
No of cations C = $6 \times \frac{75}{100} = 6 \times \frac{3}{4} = \frac{9}{2}$
 $\text{C}_{9/2}\text{A}_6$
 C_9A_{12}
Simple ratio C_3A_4
48. $\text{Ca}(\text{OH})_2(\text{s}) \rightleftharpoons \text{Ca}^{+2}(\text{aq}) + 2\text{OH}^{-}(\text{aq})$

S 2S

 $\text{pH} = 9$; $\text{pOH} = 5$; $[\text{OH}^{-}] = 10^{-5} = 2\text{S}$
 $\text{S} = \frac{10^{-5}}{2}$
 $K_{\text{sp}} = [\text{Ca}^{+2}][\text{OH}^{-}]^2$
 $K_{\text{sp}} = \text{S} \times (2\text{S})^2$
 $K_{\text{sp}} = 4\text{S}^3$
 $K_{\text{sp}} = 4 \times \left(\frac{10^{-5}}{2}\right)^3$
 $K_{\text{sp}} = 0.5 \times 10^{-15}$
49. $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightarrow 2\text{NH}_3(\text{g})$
2 mole $\text{NH}_3(\text{g})$ requires 3mole $\text{H}_2(\text{g})$
20 mole $\text{NH}_3(\text{g})$ requires
 $= \frac{3}{2} \times 20 \text{ mole } \text{H}_2(\text{g})$
 $= 30 \text{ mole}$

50. For an ideal solution, $\Delta H_{\text{mix}} = 0$

51. $E_{\text{cell}} = E^{\circ}_{\text{cell}} - \frac{2.303 RT}{nF} \log_{10} Q$
at equilibrium $E_{\text{cell}} = 0$, $Q = K_{\text{eq}}$.
 $0 = E^{\circ}_{\text{cell}} - \frac{0.0591}{1} \log_{10} K_{\text{eq}}$
 $E^{\circ}_{\text{cell}} = +0.0591 \log_{10} K_{\text{eq}}$
 $0.59 = +0.0591 \log_{10} K_{\text{eq}}$
 $+10 = \log_{10} K_{\text{eq}}$
 $K_{\text{eq}} = 10^{+10}$
52. Besides carbon dioxide, other greenhouse gases are methane, water vapour, nitrous oxide, CFCs and ozone.
53. $\text{H}-\text{C}\equiv\text{C}-\underset{\text{H}}{\underset{|}{\text{C}}}=\underset{\text{H}}{\underset{|}{\text{C}}}-\underset{\text{H}}{\underset{|}{\text{C}}}-\text{H}$
Number of sigma bonds = 10
Number of π -bonds = 3
54. According to M.O.T. electronic configuration of C_2 molecule is -
 $\sigma 1s^2 < \sigma^* 1s^2 < \sigma 2s^2 < \sigma^* 2s^2 < \pi 2p_x^2 = \pi 2p_y^2$
so, C_2 molecule contain only ' π ' bond
55. (a) $2\text{Cu}^{+} \rightarrow \text{Cu}^{+2} + \text{Cu}$
 $\left[\begin{array}{l} \text{Cu}^{+} \rightarrow \text{Cu}^{+2} (\text{oxidation}) \\ \text{Cu}^{+} \rightarrow \text{Cu}^{+2} (\text{Reduction}) \end{array} \right]$
(b) $\text{MnO}_4^{2-} \rightarrow \text{MnO}_4^{-}$ (oxidation)
 $+6 \quad +7$
 $\text{MnO}_4^{2-} \rightarrow \text{MnO}_2$ (Reduction)
 $+6 \quad +4$
The above two reaction are disproportionation.
56. The antibiotics which effective mainly against Gram-positive or Gram-negative bacteria are **narrow spectrum antibiotics**. **Penicillin G** has a narrow spectrum. ampicillin, amoxycillin, chloramphenicol are **broad spectrum antibiotics**.
57. The order of basic strength in case of methyl substituted amines and ethyl substituted amines in aqueous solution is as follows :
 $(\text{C}_2\text{H}_5)_2\text{NH} > (\text{C}_2\text{H}_5)_3\text{N} > \text{C}_2\text{H}_5\text{NH}_2 > \text{NH}_3$
 $(\text{CH}_3)_2\text{NH} > \text{CH}_3\text{NH}_2 > (\text{CH}_3)_3\text{N} > \text{NH}_3$
58. In negatively charged colloid $[\text{AgI}]^{-}$, I^{-} is preferentially adsorbed.
 $\text{AgNO}_3 + \text{KI} \rightarrow \text{AgI} + \text{KNO}_3$
When KI is in excess, I^{-} will be adsorbed on the surface of AgI and $[\text{AgI}]^{-}$ is formed

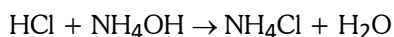
59. Conjugate base of H_2O is OH^-

Conjugate base of HF is F^-

60. Basic buffer is mixture of weak base and salt of weak base with strong acid

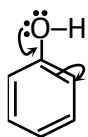
milli mole of $\text{HCl} = 100 \times 0.1 = 10$ milli mole

milli mole of $\text{NH}_4\text{OH} = 200 \times 0.1 = 20$ milli mole

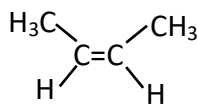


10 20 - -
- 10 10

61. In case of phenol lone pair of oxygen is delocalized in ring.



62. $\text{H}_3\text{C}-\text{C}\equiv\text{C}-\text{CH}_3 \xrightarrow[\text{(syn-addition)}]{\text{H}_2, \text{Pd/C, quinoline}}$



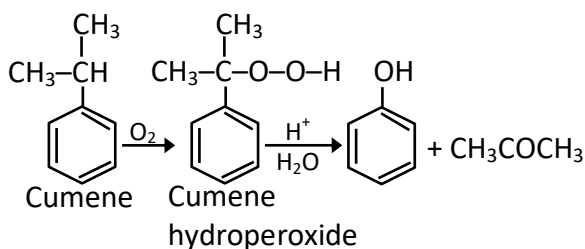
63. SiCl_6^{2-} does not exist since

(i) size of Cl^- is large so it cannot accommodate around Si^{+4} due to limitation of size

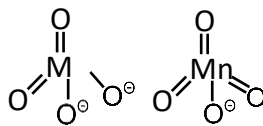
(ii) Interaction between lone pair of chloride ion and Si^{+4} is not very strong

64. $\text{Be}(\text{OH})_2$ is an amphoteric hydroxide rest all are basic hydroxides

65. Phenol is manufactured from the hydrocarbon, cumene. Cumene (isopropylbenzene) is oxidised in the presence of air to cumene hydroperoxide. it is converted to phenol and acetone by treating it with dilute acid. Acetone, a by-product of this reaction, is also obtained in large quantities by this method.



66. MnO_4^{2-} (Manganate ion) & MnO_4^- (Permanganate ion) both are tetrahedral (sp^3 Hybridisation)



Since ' π ' bond is formed between p-orbital of oxygen and d-orbital of Manganese

67. For same shell

$$[s^1 < p^1 < s^2 < p^2 < p^4 < p^3 < p^5 < p^6]$$

$$\text{Li} < \text{B} < \text{Be} < \text{C} < \text{O} < \text{N} < \text{F} < \text{Ne}$$

68. For first order reaction

$$k = \frac{1}{t} \ln \left[\frac{A_0}{A_t} \right] \quad \text{For 99\% completion,}$$

$$[A]_0 = 100, [A]_t = 1$$

$$k = \frac{1}{t} \ln \left[\frac{100}{1} \right]$$

$$k = \frac{2.303 \log_{10} 100}{t}$$

$$k = \frac{2.303 \times 2}{t}$$

$$k = \frac{4.606}{t}$$

$$t = \frac{4.606}{k}$$

- 69.

PCl_5 is reactive molecule

70. According to $(n+l)$ rule, correct order of energy is $5f > 6p > 5p > 4d$

For same value of $(n+l)$; higher is the value of n , higher will be the energy.

71. Nylon 2-nylon 6

It is an alternating polyamide copolymer of glycine ($\text{H}_2\text{N}-\text{CH}_2-\text{COOH}$) and amino caproic acid [$\text{H}_2\text{N}(\text{CH}_2)_5\text{COOH}$] and is biodegradable.

72. (a) $\text{XeF}_4 - \text{sp}^3\text{d}^2$, $\ell p = 2$, square planar

(b) $\text{XeF}_6 - \text{sp}^3\text{d}^3$, $\ell p = 1$, Distorted octahedral

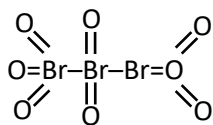
(c) $\text{XeOF}_4 - \text{sp}^3\text{d}^2$, $\ell p = 1$, Square pyramidal

(d) $\text{XeO}_3 - \text{sp}^3$, $\ell p = 1$, Pyramidal

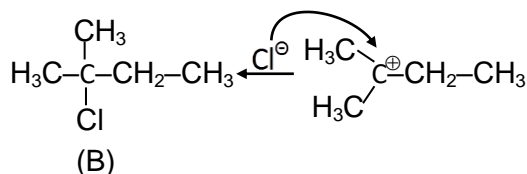
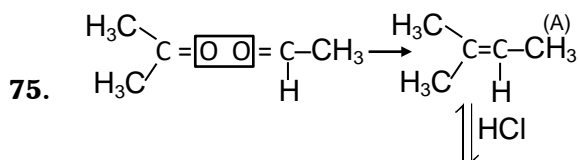
73. H_2O H_2S H_2Se H_2Te H_2Po

————→ Size of central atom increases, thermal stability decreases

74. The correct structure is :



other options are anionic



76. All enzymes that utilize ATP in phosphate transfer required magnesium as the cofactor.

77. malachite $\Rightarrow \text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$

78. In spectrum of hydrogen atom, spectral lines of Balmer series lie in visible region.

79. Maximum boiling azeotrope are formed by solutions which show negative deviation from ideal behaviour.

Water + Nitric acid shows negative deviation.

80. $2\text{Fe}^{3+}(\text{aq}) + 2\text{I}^-(\text{aq}) \rightarrow 2\text{Fe}^{2+}(\text{aq}) + \text{I}_2(\text{aq})$

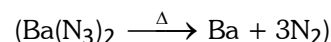
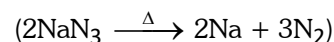
$$n = 2$$

$$\begin{aligned} \Delta G^\circ &= -nFE^\circ \\ &= -2 \times 96500 \times (0.24) \\ &= -46320 \text{ J} \\ &= -46.32 \text{ kJ mol}^{-1} \end{aligned}$$

81. $2\text{H}(\text{g}) \rightarrow \text{H}_2(\text{g})$

Due to bond formation, entropy decreases.

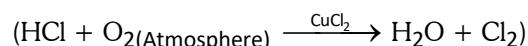
82. (a) Pure nitrogen \Rightarrow Thermal decomposition of sodiumazide or Bariumazide



(b) Haber process \Rightarrow Formation of Ammonia ($\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$)

(c) Contact process \Rightarrow Manufacture of H_2SO_4

(d) Deacon's process \Rightarrow Formation of Cl_2 gas



83. PbF_4 is an ionic compound due to large size of cation and small size of anion. Rest all are correct options

84. non-essential amino acid – alanine

Essential amino acid – valine, leucine, lysine

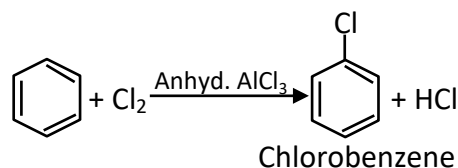
85. $(V_m)_{\text{real}} < (V_m)_{\text{ideal}}$

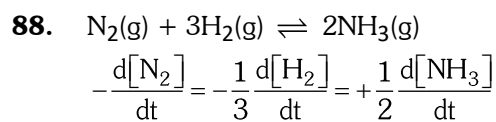
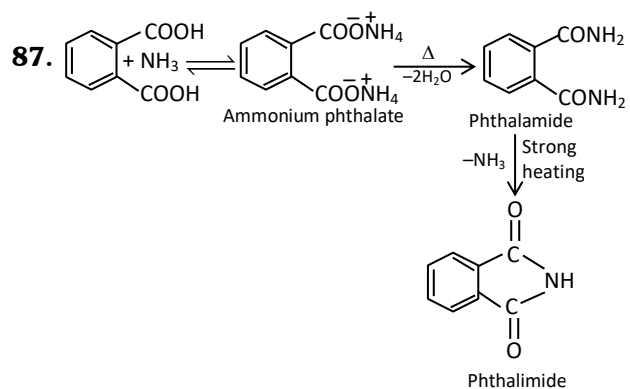
$$Z = \frac{(V_m)_{\text{real}}}{(V_m)_{\text{ideal}}}$$

$Z < 1$ and attractive forces are dominant.

86. **Halogenation (Electrophilic substitution reactions)** :

Arenes react with halogens in the presence of a Lewis acid like anhydrous AlCl_3 .





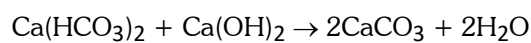
89. In $\text{K}_4[\text{Fe}(\text{CN})_6]$

$$\text{Fe}(26) = 3d^6 4s^2$$

$$\text{Fe}^{+2} = 3d^6$$

in presence of SFL $3d^6 \rightarrow t_{2g}^6 e_g^0$

90. Clark's method used to remove temporary hardness of water



NEET(UG) – 2018

1. An em wave is propagating in a medium with a velocity $\vec{V} = V\hat{i}$. The instantaneous oscillating electric field of this em wave is along +y axis. Then the direction of oscillating magnetic field of the em wave will be along :-

(1) -z direction (2) +z direction
(3) -y direction (4) -x direction

2. The refractive index of the material of a prism is $\sqrt{2}$ and the angle of the prism is 30° . One of the two refracting surfaces of the prism is made a mirror inwards, by silver coating. A beam of monochromatic light entering the prism from the other face will retrace its path (after reflection from the silvered surface) if its angle of incidence on the prism is :-

(1) 60° (2) 45° (3) 30° (4) zero

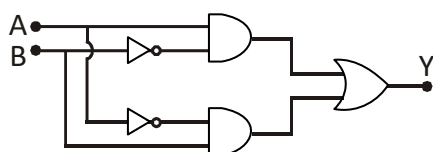
3. The magnetic potential energy stored in a certain inductor is 25 mJ, when the current in the inductor is 60 mA. This inductor is of inductance

(1) 0.138 H (2) 138.88 H
(3) 1.389 H (4) 13.89 H

4. An object is placed at a distance of 40 cm from a concave mirror of focal length 15 cm. If the object is displaced through a distance of 20 cm towards the mirror, the displacement of the image will be:-

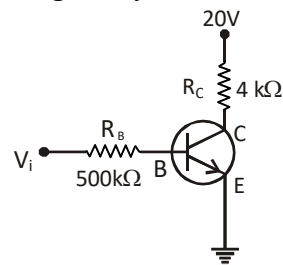
(1) 30 cm away from the mirror
(2) 36 cm away from the mirror
(3) 30 cm towards the mirror
(4) 36 cm towards the mirror

5. In the combination of the following gates the output Y can be written in terms of inputs A and B as :-



(1) $\overline{A} \cdot \overline{B}$ (2) $A \cdot \overline{B} + \overline{A} \cdot B$
(3) $\overline{A} \cdot \overline{B} + A \cdot B$ (4) $\overline{A} + \overline{B}$

6. In the circuit shown in the figure, the input voltage V_i is 20 V, $V_{BE} = 0$ and $V_{CE} = 0$. The values of I_B , I_C and β are given by :-



(1) $I_B = 40 \mu A$, $I_C = 10 \text{ mA}$, $\beta = 250$
(2) $I_B = 25 \mu A$, $I_C = 5 \text{ mA}$, $\beta = 200$
(3) $I_B = 20 \mu A$, $I_C = 5 \text{ mA}$, $\beta = 250$
(4) $I_B = 40 \mu A$, $I_C = 5 \text{ mA}$, $\beta = 125$

7. In a p-n junction diode, change in temperature due to heating :-

(1) affects only reverse resistance
(2) affects only forward resistance
(3) does not affect resistance of p-n junction
(4) affects the overall V - I characteristics of p-n junction

8. A small sphere of radius 'r' falls from rest in a viscous liquid. As a result, heat is produced due to viscous force. The rate of production of heat when the sphere attains its terminal velocity, is proportional to :-

(1) r^3 (2) r^2 (3) r^5 (4) r^4

9. A sample of 0.1 g of water at 100°C and normal pressure ($1.013 \times 10^5 \text{ Nm}^{-2}$) requires 54 cal of heat energy to convert to steam at 100°C . If the volume of the steam produced is 167.1 cc, the change in internal energy of the sample, is :-

(1) 104.3 J (2) 208.7 J
(3) 42.2 J (4) 84.5 J

10. Two wires are made of the same material and have the same volume. The first wire has cross-sectional area A and the second wire has cross-sectional area 3A. If the length of the first wire is increased by Δl on applying a force F, how much force is needed to stretch the second wire by the same amount ?

(1) 9F (2) 6F (3) 4F (4) F

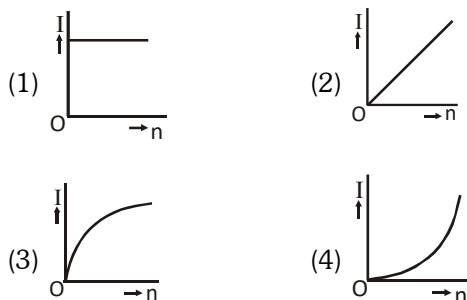
11. The power radiated by a black body is P and it radiates maximum energy at wavelength λ_0 . If the temperature of the black body is now changed so that it radiates maximum energy at wavelength $\frac{3}{4}\lambda_0$, the power radiated by it becomes nP . The value of n is :-

- (1) $\frac{3}{4}$ (2) $\frac{4}{3}$
(3) $\frac{256}{81}$ (4) $\frac{81}{256}$

12. A set of ' n ' equal resistors, of value ' R ' each, are connected in series to a battery of emf ' E ' and internal resistance ' R '. The current drawn is I . Now, the ' n ' resistors are connected in parallel to the same battery. Then the current drawn from battery becomes $10I$. The value of ' n ' is :-

- (1) 10 (2) 11 (3) 20 (4) 9

13. A battery consists of a variable number ' n ' of identical cells (having internal resistance ' r ' each) which are connected in series. The terminals of the battery are short-circuited and the current I is measured. Which of the graphs shows the correct relationship between I and n ?



14. A carbon resistor (47 ± 4.7) $k\Omega$ is to be marked with rings of different colours for its identification. The colour code sequence will be :-
- (1) Violet – Yellow – Orange – Silver
(2) Yellow – Violet – Orange – Silver
(3) Yellow – Green – Violet – Gold
(4) Green – Orange – Violet – Gold

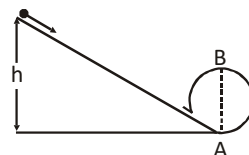
15. Which one of the following statements is **incorrect**?

- (1) Rolling friction is smaller than sliding friction
(2) Limiting value of static friction is directly proportional to normal reactions
(3) Frictional force opposes the relative motion
(4) Coefficient of sliding friction has dimensions of length

16. A moving block having mass m , collides with another stationary block having mass $4m$. The lighter block comes to rest after collision. When the initial velocity of the lighter block is v , then the value of coefficient of restitution (e) will be :-

- (1) 0.5 (2) 0.25 (3) 0.8 (4) 0.4

17. A body initially at rest and sliding along a frictionless track from a height h (as shown in the figure) just completes a vertical circle of diameter $AB = D$. The height h is equal to :-



- (1) $\frac{3}{2}D$ (2) D (3) $\frac{7}{5}D$ (4) $\frac{5}{4}D$

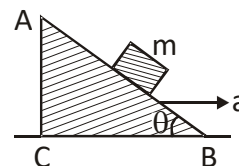
18. Three objects, A : (a solid sphere), B : (a thin circular disk) and C = (a circular ring), each have the same mass M and radius R . They all spin with the same angular speed ω about their own symmetry axes. The amounts of work (W) required to bring them to rest, would satisfy the relation :-

- (1) $W_C > W_B > W_A$ (2) $W_A > W_B > W_C$
(3) $W_B > W_A > W_C$ (4) $W_A > W_C > W_B$

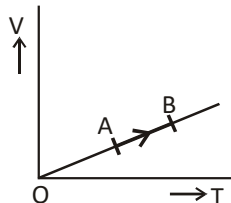
19. A tuning fork is used to produce resonance in a glass tube. The length of the air column in this tube can be adjusted by a variable piston. At room temperature of 27°C two successive resonances are produced at 20 cm and 73 cm column length. If the frequency of the tuning fork is 320 Hz, the velocity of sound in air at 27°C is:-

- (1) 330 m/s (2) 339 m/s
(3) 350 m/s (4) 300 m/s

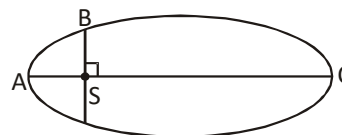
- 20.** An electron falls from rest through a vertical distance h in a uniform and vertically upward directed electric field E . The direction of electrical field is now reversed, keeping its magnitude the same. A proton is allowed to fall from rest in through the same vertical distance h . The time fall of the electron, in comparison to the time fall of the proton is :-
- (1) smaller (2) 5 times greater
(3) 10 times greater (4) equal
- 21.** A pendulum is hung from the roof of a sufficiently high building and is moving freely to and fro like a simple harmonic oscillator. The acceleration of the bob of the pendulum is 20 m/s^2 at a distance of 5 m from the mean position. The time period of oscillation is :-
- (1) $2\pi \text{ s}$ (2) $\pi \text{ s}$ (3) 2 s (4) 1 s
- 22.** The electrostatic force between the metal plates of an isolated parallel plate capacitor C having a charge Q and area A , is :-
- (1) independent of the distance between the plates.
(2) linearly proportional to the distance between the plates
(3) proportional to the square root of the distance between the plates.
(4) inversely proportional to the distance between the plates.
- 23.** An electron of mass m with an initial velocity $\vec{V} = V_0 \hat{i}$ ($V_0 > 0$) enters an electric field $\vec{E} = -E_0 \hat{i}$ ($E_0 = \text{constant} > 0$) at $t = 0$. If λ_0 is its de-Broglie wavelength initially, then its de-Broglie wavelength at time t is :-
- (1) $\frac{\lambda_0}{\left(1 + \frac{eE_0}{mV_0} t\right)}$ (2) $\lambda_0 \left(1 + \frac{eE_0}{mV_0} t\right)$
(3) $\lambda_0 t$ (4) λ_0
- 24.** For a radioactive material, half-life is 10 minutes. If initially there are 600 number of nuclei, the time taken (in minutes) for the disintegration of 450 nuclei is :-
- (1) 20 (2) 10
(3) 30 (4) 15
- 25.** When the light of frequency $2\nu_0$ (where ν_0 is threshold frequency), is incident on a metal plate, the maximum velocity of electrons emitted is v_1 . When the frequency of the incident radiation is increased to $5\nu_0$, the maximum velocity of electrons emitted from the same plate is v_2 . The ratio of v_1 to v_2 is :-
- (1) 1 : 2 (2) 1 : 4
(3) 4 : 1 (4) 2 : 1
- 26.** the ratio of kinetic energy to the total energy of an electron in a Bohr orbit of the hydrogen atom, is :-
- (1) 1 : 1 (2) 1 : -1
(3) 2 : -1 (4) 1 : -2
- 27.** The moment of the force, $\vec{F} = 4\hat{i} + 5\hat{j} - 6\hat{k}$ at $(2, 0, -3)$, about the point $(2, -2, -2)$, is given by:-
- (1) $-8\hat{i} - 4\hat{j} - 7\hat{k}$ (2) $-4\hat{i} - \hat{j} - 8\hat{k}$
(3) $-7\hat{i} - 8\hat{j} - 4\hat{k}$ (4) $-7\hat{i} - 4\hat{j} - 8\hat{k}$
- 28.** A block of mass m is placed on a smooth inclined wedge ABC of inclination θ as shown in the figure. The wedge is given an acceleration 'a' towards the right. The relation between a and θ for the block to remain stationary on the wedge is :-



- (1) $a = \frac{g}{\csc \theta}$ (2) $a = \frac{g}{\sin \theta}$
(3) $a = g \cos \theta$ (4) $a = g \tan \theta$

- 29.** A toy car with charge q moves on a frictionless horizontal plane surface under the influence of a uniform electric field \vec{E} . Due to the force $q\vec{E}$, its velocity increases from 0 to 6 m/s in one second duration. At that instant the direction of the field is reversed. The car continues to move for two more seconds under the influence of this field. The average velocity and the average speed of the toy car between 0 to 3 seconds are respectively :-
- 2 m/s, 4 m/s
 - 1 m/s, 3 m/s
 - 1 m/s, 3.5 m/s
 - 1.5 m/s, 3 m/s
- 30.** A student measured the diameter of a small steel ball using a screw gauge of least count 0.001 cm. The main scale reading is 5 mm and zero of circular scale division coincides with 25 divisions above the reference level. If screw gauge has a zero error of -0.004 cm, the correct diameter of the ball is :-
- 0.521 cm
 - 0.525 cm
 - 0.053 cm
 - 0.529 cm
- 31.** Unpolarised light is incident from air on a plane surface of a material of refractive index ' μ '. At a particular angle of incidence ' i ', it is found that the reflected and refracted rays are perpendicular to each other. Which of the following options is correct for this situation ?
- Reflected light is polarised with its electric vector parallel to the plane of incidence
 - Reflected light is polarised with its electric vector perpendicular to the plane of incidence
 - $i = \sin^{-1}\left(\frac{1}{\mu}\right)$
 - $i = \tan^{-1}\left(\frac{1}{\mu}\right)$
- 32.** In Young's double slit experiment the separation d between the slits is 2 mm, the wavelength λ of the light used is 5896 \AA and distance D between the screen and slits is 100 cm. It is found that the angular width of the fringes is 0.20° . To increase the fringe angular width to 0.21° (with same λ and D) the separation between the slits needs to be changed to :-
- 1.8 mm
 - 1.9 mm
 - 2.1 mm
 - 1.7 mm
- 33.** An astronomical refracting telescope will have large angular magnification and high angular resolution, when it has an objective lens of :-
- small focal length and large diameter
 - large focal length and small diameter
 - large focal length and large diameter
 - small focal length and small diameter
- 34.** The volume (V) of a monatomic gas varies with its temperature (T), as shown in the graph. The ratio of work done by the gas, to the heat absorbed by it, when it undergoes a change from state A to state B, is :-
- 
- $\frac{2}{5}$
 - $\frac{2}{3}$
 - $\frac{1}{3}$
 - $\frac{2}{7}$
- 35.** The fundamental frequency in an open organ pipe is equal to the third harmonic of a closed organ pipe. If the length of the closed organ pipe is 20 cm, the length of the open organ pipe is :-
- 13.2 cm
 - 8 cm
 - 12.5 cm
 - 16 cm
- 36.** The efficiency of an ideal heat engine working between the freezing point and boiling point of water, is :-
- 26.8%
 - 20%
 - 6.25%
 - 12.5%

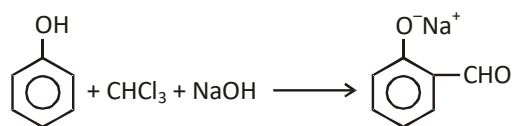
37. At what temperature will the rms speed of oxygen molecules become just sufficient for escaping from the Earth's atmosphere ?
(Given : Mass of oxygen molecule (m) = 2.76×10^{-26} kg Boltzmann's constant $k_B = 1.38 \times 10^{-23}$ J K⁻¹) :-
(1) 2.508×10^4 K (2) 8.360×10^4 K
(3) 5.016×10^4 K (4) 1.254×10^4 K
38. A metallic rod of mass per unit length 0.5 kg m^{-1} is lying horizontally on a smooth inclined plane which makes an angle of 30° with the horizontal. The rod is not allowed to slide down by flowing a current through it when a magnetic field of induction 0.25 T is acting on it in the vertical direction. The current flowing in the rod to keep it stationary is
(1) 7.14 A (2) 5.98 A
(3) 14.76 A (4) 11.32 A
39. An inductor 20 mH , a capacitor $100 \mu\text{F}$ and a resistor 50Ω are connected in series across a source of emf, $V = 10 \sin 314 t$. The power loss in the circuit is
(1) 0.79 W (2) 0.43 W
(3) 2.74 W (4) 1.13 W
40. A thin diamagnetic rod is placed vertically between the poles of an electromagnet. When the current in the electromagnet is switched on, then the diamagnetic rod is pushed up, out of the horizontal magnetic field. Hence the rod gains gravitational potential energy. The work required to do this comes from
(1) the current source
(2) the magnetic field
(3) the lattice structure of the material of the rod
(4) the induced electric field due to the changing magnetic field
41. Current sensitivity of a moving coil galvanometer is 5 div/mA and its voltage sensitivity (angular deflection per unit voltage applied) is 20 div/V . The resistance of the galvanometer is
(1) 40Ω (2) 25Ω
(3) 250Ω (4) 500Ω
42. If the mass of the Sun were ten times smaller and the universal gravitational constant were ten times larger in magnitude, which of the following is **not** correct ?
(1) Raindrops will fall faster
(2) Walking on the ground would become more difficult
(3) Time period of a simple pendulum on the Earth would decrease
(4) 'g' on the Earth will not change
43. A solid sphere is in rolling motion. In rolling motion a body possesses translational kinetic energy (K_t) as well as rotational kinetic energy (K_r) simultaneously. The ratio $K_t : (K_t + K_r)$ for the sphere is
(1) $7 : 10$ (2) $5 : 7$ (3) $10 : 7$ (4) $2 : 5$
44. The kinetic energies of a planet in an elliptical orbit about the Sun, at positions A, B and C are K_A , K_B and K_C respectively. AC is the major axis and SB is perpendicular to AC at the position of the Sun S as shown in the figure. Then



- (1) $K_A < K_B < K_C$ (2) $K_A > K_B > K_C$
(3) $K_B < K_A < K_C$ (4) $K_B > K_A > K_C$
45. A solid sphere is rotating freely about its symmetry axis in free space. The radius of the sphere is increased keeping its mass same. Which of the following physical quantities would remain constant for the sphere ?
(1) Angular velocity
(2) Moment of inertia
(3) Rotational kinetic energy
(4) Angular momentum

46. A mixture of 2.3 g formic acid and 4.5 g oxalic acid is treated with conc. H_2SO_4 . The evolved gaseous mixture is passed through KOH pellets. Weight (in g) of the remaining product at STP will be
- (1) 1.4 (2) 3.0 (3) 2.8 (4) 4.4
47. Nitration of aniline in strong acidic medium also gives m-nitroaniline because
- (1) In spite of substituents nitro group always goes to only m-position.
 (2) In electrophilic substitution reactions amino group is meta directive.
 (3) In absence of substituents nitro group always goes to m-position
 (4) In acidic (strong) medium aniline is present as anilinium ion.
48. Which of the following oxides is most acidic in nature?
- (1) MgO (2) BeO (3) BaO (4) CaO
49. The difference between amylose and amylopectin is
- (1) Amylopectin have 1 \rightarrow 4 α -linkage and 1 \rightarrow 6 α -linkage
 (2) Amylose have 1 \rightarrow 4 α -linkage and 1 \rightarrow 6 β -linkage
 (3) Amylopectin have 1 \rightarrow 4 α -linkage and 1 \rightarrow 6 β -linkage
 (4) Amylose is made up of glucose and galactose
50. Regarding cross-linked or network polymers, which of the following statements is **incorrect**?
- (1) They contain covalent bonds between various linear polymer chains.
 (2) They are formed from bi-and tri-functional monomers.
 (3) Examples are bakelite and melamine.
 (4) They contain strong covalent bonds in their polymer chains.

51. In the reaction



the electrophile involved is

- (1) dichloromethyl cation (CHCl_2^+)
 (2) formyl cation (CHO^+)
 (3) dichloromethyl anion (CHCl_2^-)
 (4) dichlorocarbene ($:\text{CCl}_2$)
52. Carboxylic acid have higher boiling points than aldehydes, ketones and even alcohols of comparable molecular mass. It is due to their
- (1) formation of intramolecular H-bonding
 (2) formation of carboxylate ion
 (3) more extensive association of carboxylic acid via van der Waals force of attraction
 (4) formation of intermolecular H-bonding.
53. Compound A, $\text{C}_8\text{H}_{10}\text{O}$, is found to react with NaOI (produced by reacting Y with NaOH) and yields a yellow precipitate with characteristic smell.
- A and Y are respectively
- (1) $\text{H}_3\text{C}-\text{C}_6\text{H}_4-\text{CH}_2-\text{OH}$ and I_2
 (2) $\text{C}_6\text{H}_5-\text{CH}_2-\text{CH}_2-\text{OH}$ and I_2
 (3) $\text{C}_6\text{H}_5-\text{CH}(\text{OH})-\text{CH}_3$ and I_2
 (4) $\text{CH}_3-\text{C}_6\text{H}_3(\text{OH})_2-\text{CH}_3$ and I_2

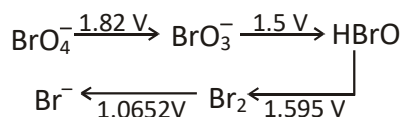
54. The correct difference between first- and second-order reaction is that

- (1) the rate of a first-order reaction does not depend on reactant concentration; the rate of a second-order reaction does depend on reactant concentrations.
- (2) the half-life of a first-order reaction does not depend on $[A]_0$; the half-life of a second-order reaction does depend on $[A]_0$
- (3) a first-order reaction can be catalyzed; a second-order reaction cannot be catalyzed.
- (4) the rate of a first-order reaction does depend on reactant concentrations; the rate of a second-order reaction does not depend on reactant concentrations

55. Among CaH_2 , BeH_2 , BaH_2 , the order of ionic character is

- (1) $\text{BeH}_2 < \text{CaH}_2 < \text{BaH}_2$
- (2) $\text{CaH}_2 < \text{BeH}_2 < \text{BaH}_2$
- (3) $\text{BeH}_2 < \text{BaH}_2 < \text{CaH}_2$
- (4) $\text{BaH}_2 < \text{BeH}_2 < \text{CaH}_2$

56. Consider the change in oxidation state of Bromine corresponding to different emf values as shown in the diagram below:



Then the species undergoing disproportionation is:-

- (1) BrO_3^- (2) BrO_4^- (3) Br_2 (4) HBrO

57. In which case is the number of molecules of water maximum?

- (1) 18 mL of water
- (2) 0.18 g of water
- (3) 0.00224 L of water vapours at 1 atm and 273 K
- (4) 10^{-3} mol of water

58. Magnesium reacts with an element (X) to form an ionic compound. If the ground state electronic configuration of (X) is $1s^2 2s^2 2p^3$, the simplest formula for this compound is

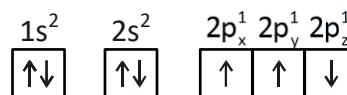
- (1) Mg_2X_3 (2) MgX_2
- (3) Mg_2X (4) Mg_3X_2

59. Iron exhibits bcc structure at room temperature. Above 900°C , it transforms to fcc structure. The ratio of density of iron at room temperature to that at 900°C (assuming molar mass and atomic radii of iron remains constant with temperature) is

- (1) $\frac{\sqrt{3}}{\sqrt{2}}$ (2) $\frac{4\sqrt{3}}{3\sqrt{2}}$
- (3) $\frac{3\sqrt{3}}{4\sqrt{2}}$ (4) $\frac{1}{2}$

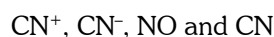
60. Which one is a **wrong** statement ?

- (1) Total orbital angular momentum of electron in 's' orbital is equal to zero
- (2) An orbital is designated by three quantum numbers while an electron in an atom is designated by four quantum numbers.
- (3) The electronic configuration of N atom is



- (4) The value of m for d_{z^2} is zero

61. Consider the following species:



Which one of these will have the highest bond order?

- (1) NO (2) CN^- (3) CN^+ (4) CN

62. Which of the following statements is **not** true for halogens ?

- (1) All form monobasic oxyacids.
- (2) All are oxidizing agents.
- (3) All but fluorine show positive oxidation states.
- (4) Chlorine has the highest electron-gain enthalpy.

63. Which one of the following elements is unable to form MF_6^{3-} ion ?

- (1) Ga (2) Al (3) B (4) In

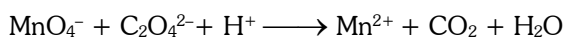
- 64.** In the structure of ClF_3 , the number of lone pairs of electrons on central atom 'Cl' is
(1) one (2) two (3) four (4) three
- 65.** Considering Ellingham diagram, which of the following metals can be used to reduce alumina ?
(1) Fe (2) Zn (3) Mg (4) Cu
- 66.** The correct order of atomic radii in group 13 elements is
(1) $\text{B} < \text{Al} < \text{In} < \text{Ga} < \text{Tl}$
(2) $\text{B} < \text{Al} < \text{Ga} < \text{In} < \text{Tl}$
(3) $\text{B} < \text{Ga} < \text{Al} < \text{Tl} < \text{In}$
(4) $\text{B} < \text{Ga} < \text{Al} < \text{In} < \text{Tl}$
- 67.** The correct order of N-compounds in its decreasing order of oxidation states is
(1) $\text{HNO}_3, \text{NO}, \text{N}_2, \text{NH}_4\text{Cl}$
(2) $\text{HNO}_3, \text{NO}, \text{NH}_4\text{Cl}, \text{N}_2$
(3) $\text{HNO}_3, \text{NH}_4\text{Cl}, \text{NO}, \text{N}_2$
(4) $\text{NH}_4\text{Cl}, \text{N}_2, \text{NO}, \text{HNO}_3$
- 68.** On which of the following properties does coagulating power of an ion depend ?
(1) The magnitude of the charge on the alone
(2) Size of the ion alone
(3) Both magnitude and sign of the charge the ion
(4) The sign of charge on the ion alone
- 69.** Following solutions were prepared by mixing different volumes of NaOH and HCl of different concentrations :
a. $60\text{mL} \frac{\text{M}}{10} \text{HCl} + 40\text{mL} \frac{\text{M}}{10} \text{NaOH}$
b. $55\text{mL} \frac{\text{M}}{10} \text{HCl} + 45\text{mL} \frac{\text{M}}{10} \text{NaOH}$
c. $75\text{mL} \frac{\text{M}}{5} \text{HCl} + 25\text{mL} \frac{\text{M}}{5} \text{NaOH}$
d. $100\text{mL} \frac{\text{M}}{10} \text{HCl} + 100\text{mL} \frac{\text{M}}{10} \text{NaOH}$
pH of which one of them will be equal to 1 ?
(1) b (2) a
(3) d (4) c
- 70.** The solubility of BaSO_4 in water $2.42 \times 10^3 \text{ gL}^{-1}$ at 298 K. The value of solubility product (K_{sp}) will be
(Given molar mass of $\text{BaSO}_4 = 233 \text{ g mol}^{-1}$)
(1) $1.08 \times 10^{-10} \text{ mol}^2 \text{ L}^{-2}$
(2) $1.08 \times 10^{-12} \text{ mol}^2 \text{ L}^{-2}$
(3) $1.08 \times 10^{-14} \text{ mol}^2 \text{ L}^{-2}$
(4) $1.08 \times 10^{-8} \text{ mol}^2 \text{ L}^{-2}$
- 71.** Given van der Waals constant for NH_3 , H_2 and CO_2 are respectively 4.17, 0.244, 1.36 and 3.59, which one of the following gases is most easily liquefied?
(1) NH_3 (2) H_2
(3) O_2 (4) CO_2
- 72.** The compound A on treatment with Na gives B, and with PCl_5 gives C. B and C react together to give diethyl ether. A, B and C are in the order
(1) $\text{C}_2\text{H}_5\text{OH}, \text{C}_2\text{H}_6, \text{C}_2\text{H}_5\text{Cl}$
(2) $\text{C}_2\text{H}_5\text{OH}, \text{C}_2\text{H}_5\text{Cl}, \text{C}_2\text{H}_5\text{ONa}$
(3) $\text{C}_2\text{H}_5\text{Cl}, \text{C}_2\text{H}_6, \text{C}_2\text{H}_5\text{OH}$
(4) $\text{C}_2\text{H}_5\text{OH}, \text{C}_2\text{H}_5\text{ONa}, \text{C}_2\text{H}_5\text{Cl}$
- 73.** Hydrocarbon (A) reacts with bromine by substitution to form an alkyl bromide which by Wurtz reaction is converted to gaseous hydrocarbon containing less than four carbon atoms. (A) is
(1) $\text{CH}\equiv\text{CH}$ (2) $\text{CH}_2=\text{CH}_2$
(3) CH_3-CH_3 (4) CH_4
- 74.** The compound C_7H_8 undergoes the following reactions :
$$\text{C}_7\text{H}_8 \xrightarrow{3\text{Cl}_2/\Delta} \text{A} \xrightarrow{\text{Br}_2/\text{Fe}} \text{B} \xrightarrow{\text{Zn}/\text{HCl}} \text{C}$$

The product 'C' is
(1) m-bromotoluene
(2) o-bromotoluene
(3) 3-bromo-2,4,6-trichlorotoluene
(4) p-bromotoluene

75. Which oxide of nitrogen is **not** a common pollutant introduced into the atmosphere both due to natural and human activity ?

- (1) N_2O_5 (2) NO_2 (3) N_2O (4) NO

76. For the redox reaction

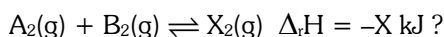


the correct coefficients of the reactants for the balanced equation are



- (1) 16 5 2
(2) 2 5 16
(3) 2 16 5
(4) 5 16 2

77. Which one of the following conditions will favour maximum formation of the product in the reaction,



- (1) Low temperature and high pressure
(2) Low temperature and low pressure
(3) High temperature and high pressure
(4) High temperature and low pressure

78. The correction factor 'a' to the ideal gas equation corresponds to

- (1) density of the gas molecules
(2) volume of the gas molecules
(3) electric field present between the gas molecules
(4) forces of attraction between the gas molecules

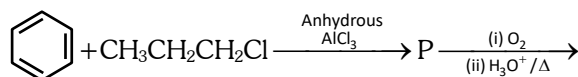
79. When initial concentration of the reactant is doubled, the half-life period of a zero order reaction

- (1) is halved
(2) is doubled
(3) is tripled
(4) remains unchanged

80. The bond dissociation energies of X_2 , Y_2 and XY are in the ratio of 1 : 0.5 : 1. ΔH for the formation of XY is -200 kJ mol^{-1} . The bond dissociation energy of X_2 will be

- (1) 200 kJ mol^{-1}
(2) 100 kJ mol^{-1}
(3) 800 kJ mol^{-1}
(4) 400 kJ mol^{-1}

81. Identify the major products P, Q and R in the following sequence of reaction :

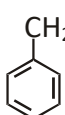
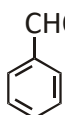
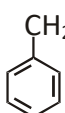
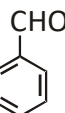
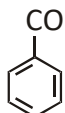


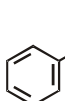
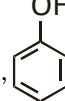


Q + R

P

Q

R

- (1)  ,  , $\text{CH}_3\text{CH}_2\text{OH}$
(2)  ,  , 
(3)  ,  , $\text{CH}_3\text{CH}(\text{OH})\text{CH}_3$
(4)  ,  , CH_3COCH_3

82. Which of the following compounds can form a zwitterion ?

- (1) Aniline
(2) Acetanilide
(3) Benzoic acid
(4) Glycine

83. The type of isomerism shown by the complex $[\text{CoCl}_2(\text{en})_2]$ is

- (1) Geometrical isomerism
- (2) Coordination isomerism
- (3) Ionization isomerism
- (4) Linkage isomerism

84. Which one of the following ions exhibits d-d transition and paramagnetism as well ?

- (1) CrO_4^{2-} (2) $\text{Cr}_2\text{O}_7^{2-}$ (3) MnO_4^- (4) MnO_4^{2-}

85. The geometry and magnetic behaviour of the complex $[\text{Ni}(\text{CO})_4]$ are

- (1) square planar geometry and diamagnetic
- (2) tetrahedral geometry and diamagnetic
- (3) square planar geometry and paramagnetic
- (4) tetrahedral geometry and paramagnetic

86. Iron carbonyl, $\text{Fe}(\text{CO})_5$ is

- (1) tetranuclear (2) mononuclear
- (3) trinuclear (4) dinuclear

87. Match the metal ions given in Column I with the spin magnetic moments of the ions given in Column II and assign the **correct** code :

Column I

- a. Co^{3+}
- b. Cr^{3+}
- c. Fe^{3+}
- d. Ni^{2+}

Column II

- i. $\sqrt{8}$ B.M.
- ii. $\sqrt{35}$ B.M.
- iii. $\sqrt{3}$ B.M.
- iv. $\sqrt{24}$ B.M.
- v. $\sqrt{15}$ B.M.

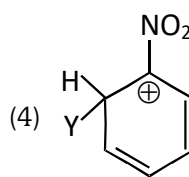
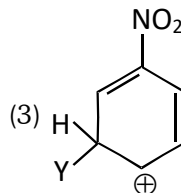
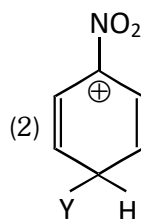
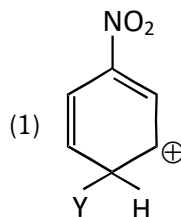
a b c d

- (1) iv v ii i
- (2) i ii iii iv
- (3) iv i ii iii
- (4) iii v i ii

88. Which of the following is correct with respect to -I effect of the substituents ? (R = alkyl)

- (1) $-\text{NH}_2 < -\text{OR} < -\text{F}$
- (2) $-\text{NR}_2 < -\text{OR} < -\text{F}$
- (3) $-\text{NH}_2 > -\text{OR} > -\text{F}$
- (4) $-\text{NR}_2 > -\text{OR} > -\text{F}$

89. Which of the following carbocations is expected to be most stable ?



90. Which of the following molecules represents the order of hybridisation sp^2 , sp^2 , sp , sp from left to right atoms ?

- (1) $\text{HC} \equiv \text{C} - \text{C} \equiv \text{CH}$
- (2) $\text{CH}_2 = \text{CH} - \text{C} \equiv \text{CH}$
- (3) $\text{CH}_2 = \text{CH} - \text{CH} = \text{CH}_2$
- (4) $\text{CH}_3 - \text{CH} = \text{CH} - \text{CH}_3$

91. The experimental proof for semiconservative replication of DNA was first shown in a
(1) Fungus (2) Bacterium
(3) Plant (4) Virus
92. Select the **correct** statement :
(1) Franklin Stahl coined the term "linkage".
(2) Punnett square was developed by a British scientist.
(3) Spliceosomes take part in translation.
(4) Transduction was discovered by S. Altman.
93. Offsets are produced by
(1) Meiotic divisions (2) Mitotic divisions
(3) Parthenocarp (4) Parthenogenesis
94. Which of the following pairs in **wrongly** matched ?
(1) Starch synthesis : Multiple alleles in pea
(2) ABO blood grouping : Co-dominance
(3) XO type sex : Grasshopper determination
(4) T.H. Morgan : Linkage
95. Which of the following flowers only once in its life-time ?
(1) Bamboo species (2) Jackfruit
(3) Mango (4) Papaya
96. Select the **correct** match :
(1) Alec Jeffreys – *Streptococcus pneumoniae*
(2) Alfred Hershey and Martha Chase – TMV
(3) Matthew Meselson and F. Stahl – *Pisum sativum*
(4) Francois Jacob and Jacques Monod – Lac operon
97. Which of the following has proved helpful in preserving pollen as fossils ?
(1) Pollenkitt (2) Cellulosic intine
(3) Oil content (4) Sporopollenin
98. Stomatal movement is not affected by
(1) Temperature
(2) Light
(3) O₂ concentration
(4) CO₂ concentration
99. The stage during which separation of the paired homologous chromosomes begins is
(1) Pachytene (2) Diplotene
(3) Diakinesis (4) Zygotene
100. The two functional groups characteristic of sugars are
(1) hydroxyl and methyl
(2) carbonyl and methyl
(3) carbonyl and phosphate
(4) carbonyl and hydroxyl
101. Which of the following is **not** a product of light reaction of photosynthesis ?
(1) ATP (2) NADH
(3) NADPH (4) Oxygen
102. Stomata in grass leaf are
(1) Dumb-bell shaped (2) Kidney shaped
(3) Rectangular (4) Barrel shaped
103. Which among the following is **not** a prokaryote?
(1) *Saccharomyces* (2) *Mycobacterium*
(3) *Nostoc* (4) *Oscillatoria*
104. Which of the following is true for nucleolus ?
(1) Larger nucleoli are present in dividing cells.
(2) It is a membrane-bound structure.
(3) It takes part in spindle formation.
(4) It is a site for active ribosomal RNA synthesis.
105. The Golgi complex participates in
(1) Fatty acid breakdown
(2) Formation of secretory vesicles
(3) Respiration in bacteria
(4) Activation of amino acid

- 106.** In stratosphere, which of the following element acts as a catalyst in degradation of ozone a release of molecular oxygen ?
 (1) Carbon (2) Cl
 (3) Fe (4) Oxygen
- 107.** Which of the following is a secondary pollutant
 (1) CO (2) CO₂ (3) SO₂ (4) O₃
- 108.** Niche is
 (1) all the biological factors in the organism environment
 (2) the physical space where an organism live
 (3) the range of temperature that the organism needs to live
 (4) the functional role played by the organism where it lives
- 109.** Natalty refers to
 (1) Death rate
 (2) Birth rate
 (3) Number of individuals leaving the habitat
 (4) Number of individuals entering a habitat
- 110.** What type of ecological pyramid would obtained with the following data ?
 Secondary consumer : 120 g
 Primary consumer : 60 g
 Primary producer : 10 g
 (1) Inverted pyramid of biomass
 (2) Pyramid of energy
 (3) Upright pyramid of numbers
 (4) Upright pyramid of biomass
- 111.** World Ozone Day is celebrated on
 (1) 5th June (2) 21st April
 (3) 16th September (4) 22nd April
- 112.** Which of the following is commonly used as a vector for introducing a DNA fragment in human lymphocytes ?
 (1) Retrovirus (2) Ti plasmid
 (3) λ phage (4) pBR 322
- 113.** In India, the organisation responsible for assessing the safety of introducing genetically modified organisms for public use is
 (1) Indian Council of Medical Research (ICMR)
 (2) Council for Scientific and Industrial Research (CSIR)
 (3) Research Committee on Genetic Manipulation (RCGM)
 (4) Genetic Engineering Appraisal Committee (GEAC)
- 114.** A 'new variety of rice was patented by a foreign company though such varieties have been present in India for a long time. This is related to
 (1) Co-667 (2) Sharbati Sonora
 (3) Lerma Rojo (4) Basmati
- 115.** Select the **correct** Match :
 (1) Ribozyme - Nucleic acid
 (2) F₂ \times Recessive parent - Dihybrid cross
 (3) T.H. Morgan - Transduction
 (4) G. Mendel - Transformation
- 116.** Use of bioresources by multinational companies and organisations without authorisation from the concerned country and its people is called
 (1) Bio-infringement (2) Biopiracy
 (3) Biodegradation (4) Bioexploitation
- 117.** The correct order of steps in Polymerase Chain Reaction (PCR) is
 (1) Extension, Denaturation, Annealing
 (2) Annealing, Extension, Denaturation
 (3) Denaturation, Extension, Annealing
 (4) Denaturation, Annealing, Extension
- 118.** Secondary xylem and phloem in dicot stem are produced by
 (1) Apical meristems
 (2) Vascular cambium
 (3) Phellogen
 (4) Axillary meristems

119. Pneumatophores occur in

- (1) Halophytes
- (2) Free-floating hydrophytes
- (3) Carnivorous plants
- (4) Submerged hydrophytes

120. Sweet potato is a modified

- (1) Stem
- (2) Adventitious root
- (3) Tap root
- (4) Rhizome

121. Which of the following statement is **correct** ?

- (1) Ovules are not enclosed by ovary wall in gymnosperms
- (2) *Selaginella* is heterosporous, while *Salvinia* is homosporous
- (3) Horsetails are gymnosperms
- (4) Stems are usually unbranched in both *Cycas* and *Cedrus*

122. Select the **wrong** statement :

- (1) Cell wall is present in members of Fungi and Plantae
- (2) Mushrooms belong to Basidiomycetes
- (3) Pseudopodia are locomotory and feeding structures in Sporozoans
- (4) Mitochondria are the powerhouse of the cell in all kingdoms except Monera

123. Casparian strips occur in

- (1) Epidermis
- (2) Pericycle
- (3) Cortex
- (4) Endodermis

124. Plants having little or no secondary growth are

- (1) Grasses
- (2) Deciduous angiosperms
- (3) Conifers
- (4) Cycads

125. Which one is **wrongly** matched ?

- (1) Uniflagellate gametes - *Polysiphonia*
- (2) Biflagellate zoospores - Brown algae
- (3) Gemma cups - *Marchantia*
- (4) Unicellular organism - *Chlorella*

126. Match the items given in Column I with those in

Column II and select the **correct** option given below :-

Column-I	Column-II
(a) Herbarium	i. It is a place having a collection of preserved plants and animals.
(b) Key	ii. A list that enumerates methodically all the species found in an area with brief description aiding identification.
(c) Museum	iii. Is a place where dried and pressed plant specimens mounted on sheets are kept.
(d) Catalogue	iv. A booklet containing a list of characters and their alternates which are helpful in identification of various taxa.

a	b	c	d
(1) i	iv	iii	ii
(2) iii	ii	i	iv
(3) ii	iv	iii	i
(4) iii	iv	i	ii

127. Winged pollen grains are present in

- (1) Mustard
- (2) *Cycas*
- (3) Mango
- (4) *Pinus*

128. After karyogamy followed by meiosis, spores are produced exogenously in

- (1) *Neurospora*
- (2) *Alternaria*
- (3) *Agaricus*
- (4) *Saccharomyces*

- 129.** What is the role of NAD^+ in cellular respiration ?
 (1) It functions as an enzymes
 (2) It functions as an electron carrier
 (3) It is a nucleotide source for ATP synthesis
 (4) It is the final electron acceptor for anaerobic respiration
- 130.** Oxygen is **not** produced during photosynthesis by
 (1) Green sulphur bacteria
 (2) *Nostoc*
 (3) *Cycas*
 (4) *Chara*
- 131.** Pollen grains can be stored for several years in liquid nitrogen having a temperature of
 (1) -120°C (2) -80°C
 (3) -196°C (4) -160°C
- 132.** In which of the following forms is iron absorbed by plants ?
 (1) Ferric
 (2) Ferrous
 (3) Free element
 (4) Both ferric and ferrous
- 133.** Double fertilization is
 (1) Fusion of two male gametes of a pollen tube with two different eggs
 (2) Fusion of one male gamete with two polar nuclei
 (3) Fusion of two male gametes with one egg
 (4) Syngamy and triple fusion
- 134.** Which of the following elements is responsible for maintaining turgor in cells ?
 (1) Magnesium (2) Sodium
 (3) Potassium (4) Calcium
- 135.** Which one of the following plants shows a very close relationship with a species of moth, where none of the two can complete its life cycle without the other?
 (1) *Hydrilla* (2) *Yucca*
 (3) *Banana* (4) *Viola*
- 136.** Hormones secreted by the placenta to maintain pregnancy are
 (1) hCG, hPL, progesterones, prolactin
 (2) hCG, hPL, estrogens, relaxin, oxytocin
 (3) hCG, hPL, progesterones, estrogens
 (4) hCG, progesterones, estrogens, glucocorticoids
- 137.** The contraceptive 'SAHELI'
 (1) blocks estrogen receptors in the uterus, preventing eggs from getting implanted.
 (2) increases the concentration of estrogen and prevents ovulation in females.
 (3) is an IUD.
 (4) is a post-coital contraceptive.
- 138.** The difference between spermiogenesis and spermiation is
 (1) In spermiogenesis spermatids are formed, while in spermiation spermatozoa are formed.
 (2) In spermiogenesis spermatozoa are formed, while in spermiation spermatids are formed.
 (3) In spermiogenesis spermatozoa from Sertoli cells are released into the cavity of seminiferous tubules, while in spermiation spermatozoa are formed.
 (4) In spermiogenesis spermatozoa are formed, while in spermiation spermatozoa are released from Sertoli cells into the cavity of seminiferous tubules.
- 139.** The amnion of mammalian embryo is derived from
 (1) ectoderm and mesoderm
 (2) endoderm and mesoderm
 (3) mesoderm and trophoblast
 (4) ectoderm and endoderm
- 140.** In a growing population of a country
 (1) pre-reproductive individuals are more than the reproductive individuals.
 (2) reproductive individuals are less than the post-reproductive individuals.
 (3) reproductive and pre-reproductive individuals are equal in number.
 (4) pre-reproductive individuals are less than the reproductive individuals.
- 141.** All of the following are included in 'Ex-situ conservation' *except*
 (1) Wildlife safari parks
 (2) Sacred groves
 (3) Botanical gardens
 (4) Seed banks

142. Which part of poppy plant is used to obtain the drug, "Smack" ?

- (1) Flowers (2) Latex
(3) Roots (4) Leaves

143. Match the items given in Column I with those in Column II and select the **correct** option given below:

Column I	Column II
a. Eutrophication	i. UV-B radiation
b. Sanitary landfill	ii. Deforestation
c. Snow blindness	iii. Nutrient enrichment
d. Jhum cultivation	iv. Waste disposal

- | a | b | c | d |
|---------|-----|-----|-----|
| (1) ii | i | iii | iv |
| (2) i | iii | iv | ii |
| (3) iii | iv | i | ii |
| (4) i | ii | iv | iii |

144. Which one of the following population interactions is widely used in medical science for the production of antibiotics ?

- (1) Commensalism (2) Mutualism
(3) Parasitism (4) Amensalism

145. Which of the following events does **not** occur in rough endoplasmic reticulum ?

- (1) Protein folding
(2) Protein glycosylation
(3) Cleavage of signal peptide
(4) Phospholipid synthesis

146. Which of these statements is **incorrect** ?

- (1) Enzymes of TCA cycle are present in mitochondrial matrix.
(2) Glycolysis occurs in cytosol.
(3) Glycolysis operates as long as it is supplied with NAD that can pick up hydrogen atoms.
(4) Oxidative phosphorylation takes place in outer mitochondrial membrane.

147. Many ribosomes may associate with a single mRNA to form multiple copies of a polypeptide simultaneously. Such strings of ribosomes are termed as

- (1) Polysome (2) Polyhedral bodies
(3) Plastidome (4) Nucleosome

148. Select the **incorrect** match :

- (1) Lampbrush – Diplotene bivalents chromosomes
(2) Allosomes – Sex chromosomes
(3) Submetacentric – L-shaped chromosomes
(4) Polytene – Oocytes of amphibians chromosomes

149. Nissl bodies are mainly composed of

- (1) Proteins and lipids
(2) DNA and RNA
(3) Nucleic acids and SER
(4) Free ribosomes and RER

150. Which of the following terms describe human dentition ?

- (1) Thecodont, Diphyodont, Homodont
(2) Thecodont, Diphyodont, Heterodont
(3) Pleurodont, Monophyodont, Homodont
(4) Pleurodont, Diphyodont, Heterodont

151. Match the items given in Column I with those in Column II and select the **correct** option given below:

Column I	Column II
a. Glycosuria	i. Accumulation of uric acid in joints
b. Gout	ii. Mass of crystallised salts within the kidney
c. Renal calculi	iii. Inflammation in glomeruli
d. Glomerular nephritis	iv. Presence of glucose in urine

- | a | b | c | d |
|---------|-----|-----|-----|
| (1) iii | ii | iv | i |
| (2) i | ii | iii | iv |
| (3) ii | iii | i | iv |
| (4) iv | i | ii | iii |

- 152.** Match the items given in Column I with those in Column II and select the **correct** option given below:

Column I (Function)	Column II (Part of Excretory System)
a. Ultrafiltration	i. Henle's loop
b. Concentration of urine	ii. Ureter
c. Transport of iii. urine	Urinary bladder
d. Storage of urine	iv. Malpighian corpuscle
	v. Proximal convoluted tubule

	a	b	c	d
(1)	iv	v	ii	iii
(2)	iv	i	ii	iii
(3)	v	iv	i	ii
(4)	v	iv	i	iii

- 153.** The similarity of bone structure in the forelimbs of many vertebrates is an example of
 (1) Homology (2) Analogy
 (3) Convergent evolution (4) Adaptive radiation
- 154.** Which of the following is **not** an autoimmune disease?
 (1) Psoriasis
 (2) Rheumatoid arthritis
 (3) Alzheimer's disease
 (4) Vitiligo
- 155.** Among the following sets of examples for divergent evolution, select the **incorrect** option:
 (1) Forelimbs of man, bat and cheetah
 (2) Heart of bat, man and cheetah
 (3) Brain of bat, man and cheetah
 (4) Eye of octopus, bat and man
- 156.** Which of the following characteristics represent 'Inheritance of blood groups' in humans?
 a. Dominance
 b. Co-dominance
 c. Multiple dominance
 d. Incomplete dominance
 e. Polygenic inheritance
 (1) b, c and e (2) a, b and c
 (3) b, d and e (4) a, c and e
- 157.** In which disease does mosquito transmitted pathogen cause chronic inflammation of lymphatic vessels?
 (1) Elephantiasis (2) Ascariasis
 (3) Ringworm disease (4) Amoebiasis
- 158.** Conversion of milk to curd improves its nutritional value by increasing the amount of
 (1) Vitamin D (2) Vitamin A
 (3) Vitamin B₁₂ (4) Vitamin E
- 159.** Which of the following is an amino acid derived hormone?
 (1) Epinephrine (2) Ecdysone
 (3) Estradiol (4) Estrinol
- 160.** Which of the following structures or regions is **incorrectly** paired with its function?
 (1) Medulla oblongata : controls respiration and cardiovascular reflexes.
 (2) Limbic system : consists of fibre tracts that interconnect different regions of brain; controls movement.
 (3) Hypothalamus : production of releasing hormones and regulation of temperature, hunger and thirst.
 (4) Corpus callosum : band of fibers connecting left and right cerebral hemispheres.
- 161.** Which of the following hormones can play a significant role in osteoporosis?
 (1) Aldosterone and Prolactin
 (2) Progesterone and Aldosterone
 (3) Estrogen and Parathyroid hormone
 (4) Parathyroid hormone and Prolactin

162. The transparent lens in the human eye is held in its place by

- (1) ligaments attached to the ciliary body
- (2) ligaments attached to the iris
- (3) smooth muscles attached to the iris
- (4) smooth muscles attached to the ciliary body

163. Which of the following animals does **not** undergo metamorphosis ?

- (1) Earthworm
- (2) Tunicate
- (3) Moth
- (4) Starfish

164. Identify the vertebrate group of animals characterized by crop and gizzard in its digestive system.

- (1) Amphibia
- (2) Reptilia
- (3) Aves
- (4) Osteichthyes

165. Which of the following organisms are known as chief producers in the oceans ?

- (1) Dinoflagellates
- (2) Diatoms
- (3) Cyanobacteria
- (4) Euglenoids

166. Which one of these animals is **not** a homeotherm?

- (1) *Macropus*
- (2) *Chelone*
- (3) *Camelus*
- (4) *Psittacula*

167. Ciliates differ from all other protozoans in

- (1) using flagella for locomotion
- (2) having a contractile vacuole for removing excess water
- (3) using pseudopodia for capturing prey
- (4) having two types of nuclei

168. Which of the following features is used to identify a male cockroach from a female cockroach ?

- (1) Presence of a boat shaped sternum on the 9th abdominal segment
- (2) Presence of caudal styles
- (3) Forewings with darker tegmina
- (4) Presence of anal cerci

169. Which of the following options correctly represents the lung conditions in asthma and emphysema, respectively ?

- (1) Inflammation of bronchioles; Decreased respiratory surface
- (2) Increased number of bronchioles; Increased respiratory surface
- (3) Increased respiratory surface; Inflammation of bronchioles
- (4) Decreased respiratory surface; Inflammation of bronchioles

170. Match the items given in Column I with those in Column II and select the **correct** option given below:

Column I	Column II
a. Tricuspid valve	i. Between left atrium and left ventricle
b. Bicuspid valve	ii. Between right ventricle and pulmonary artery
c. Semilunar valve	iii. Between right atrium and right ventricle

a	b	c
(1) iii	i	ii
(2) i	iii	ii
(3) i	ii	iii
(4) ii	i	iii

171. Match the items given Column I with those in Column II and select the **correct** option given below :

Column I	Column II
a. Tidal volume	i. 2500-3000 mL
b. Inspiratory Reserve volume	ii. 1100-1200 mL
c. Expiratory Reserve volume	iii. 500-550 mL
d. Residual volume	iv. 1000-1100 mL

a	b	c	d
(1) iii	ii	i	iv
(2) iii	i	iv	ii
(3) ii	v	ii	iii
(4) iv	iii	ii	i

172. AGGTATCGCAT is a sequence from the coding strand of a gene. What will be the corresponding sequence of the transcribed mRNA ?

- (1) AGGUAUCGCAU (2) UGGTUTCAT
(3) ACCUAUGCGAU (4) UCCAUAGCGUA

173. According to Hugo de Vries, the mechanism of evolution is :-

- (1) Multiple step mutations
(2) Saltation
(3) Phenotypic variations
(4) Minor mutations

174. Match the items given in Column I with those in Column II and select the **correct** option given below

Column I	Column II
a. Proliferative Phase	i. Breakdown of endometrial lining
b. Secretory Phase	ii. Follicular Phase
c. Menstruation	iii. Luteal Phase

a	b	c
(1) iii	ii	i
(2) i	iii	ii
(3) ii	iii	i
(4) iii	i	ii

175. A woman has an X-linked condition on one of her X chromosomes. This chromosome can be inherited by :-

- (1) Only daughters
(2) Only sons
(3) Only grandchildren
(4) Both sons and daughters

176. All of the following are part of an operon *except*

- (1) an operator (2) structural genes
(3) an enhancer (4) a promoter

177. Which of the following gastric cells indirectly help in erythropoiesis ?

- (1) Chief cells (2) Mucous cells
(3) Goblet cells (4) Parietal cells

178. Match the items given in Column I with those in Column II and select the **correct** option given below :-

Column I	Column II
a. Fibrinogen	i. Osmotic balance
b. Globulin	ii. Blood clotting
c. Albumin	iii. Defence mechanism

a	b	c
(1) iii	ii	i
(2) i	ii	iii
(3) i	iii	ii
(4) ii	iii	i

179. Calcium is important in skeletal muscle contraction because it :-

- (1) binds to troponin to remove the masking of active sites on actin for myosin.
(2) activates the myosin ATPase by binding to it.
(3) detaches the myosin head from the actin filament.
(4) prevents the formation of bonds between the myosin cross bridges and the actin filament.

180. Which of the following is an occupational respiratory disorder ? :

- (1) Anthracis (2) Silicosis
(3) Botulism (4) Emphysema

ANSWER KEY

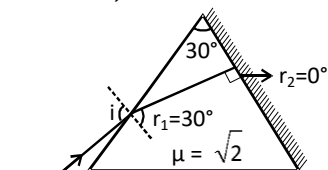
NEET(UG)-2018

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	2	2	4	2	2	4	4	3	2	1	3	1	1	2	4
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	2	4	1	2	1	2	1	1	1	1	2	4	4	2	4
Que.	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Ans.	2	2	3	1	1	1	2	4	1	1	3	4	2	2	4
Que.	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ans.	3	4	2	1	4	4	4	3	2	1	4	1	4	3	3
Que.	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Ans.	2	B	3	2	3	4	1	3	4	1	1	4	4	1	1
Que.	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
Ans.	2	1	4	2	3	4	4	1	4	2	2	1	1,2	3	2
Que.	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105
Ans.	2	2	2	1	1	4	4	3	2	4	2	1	1	4	2
Que.	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
Ans.	2	4	4	2	1	3	1	4	4	1	2	4	2	1	2
Que.	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135
Ans.	1	3	4	1	1	4	4	3	2	1	3	1	4	3	2
Que.	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
Ans.	3	1	4	1	1	2	2	3	4	4	4	1	4	4	2
Que.	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165
Ans.	4	2	1	3	4	2	1	3	1	2	3	1	1	3	2
Que.	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
Ans.	2	4	2	1	1	2	1	2	3	4	3	4	4	1	2

HINT - SHEET

1. $\hat{V} = \hat{E} \times \hat{B}$, $\hat{i} = \hat{j} \times \hat{k}$

$\therefore \hat{B} = \hat{k}$, +z direction



2. $r_2 = 0$, $r_1 = A = 30^\circ$

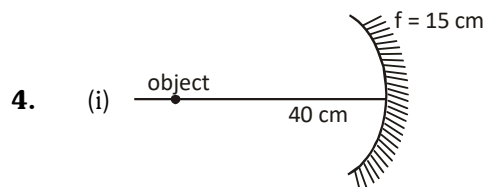
By using snell's law

$$\sin i = \sqrt{2} \sin 30^\circ = \sqrt{2} \times \frac{1}{2} = \frac{1}{\sqrt{2}} \Rightarrow \angle i = 45^\circ$$

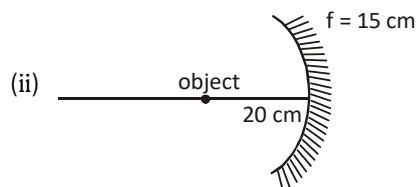
3. Magnetic potential energy $= \frac{1}{2} LI^2$

$$\Rightarrow 25 \times 10^{-3} = \frac{1}{2} L (60 \times 10^{-3})^2$$

$$\Rightarrow L = 13.89 \text{ H}$$

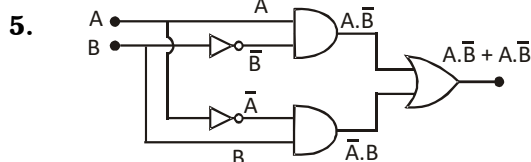


$$v_1 = \frac{uf}{u-f} = \frac{(-40)(-15)}{-40+15} = \frac{600}{-25} = -24 \text{ cm}$$



$$v_2 = \frac{uf}{u-f} = \frac{(-20)(-15)}{-20+15} = -60 \text{ cm}$$

Displacement of image $= v_2 - v_1 = -36 \text{ cm}$
 $= 36 \text{ cm}$ away from the mirror



6. $V_i = I_B R_B + V_{BE}$

$$\Rightarrow 20 = I_B \times (500 \times 10^3) + 0$$

$$\Rightarrow I_B = \frac{20}{500 \times 10^3} = 40 \mu A$$

$$V_{CC} = I_C R_C + V_{CE}$$

$$\Rightarrow 20 = I_C \times (4 \times 10^3) + 0$$

$$\Rightarrow I_C = 5 \times 10^{-3} = 5 \text{ mA}$$

$$\beta = \frac{I_C}{I_B} = \frac{5 \times 10^{-3}}{40 \times 10^{-6}} = 125$$

7. Due is heating, number of electron hold pairs will increase that affects the overall V - I characteristics of p-n junction

8. Rate of heat produced

$$\frac{dQ}{dt} = F_v \times v_T \quad \because v_T = \frac{2r^2}{9\eta} (\rho - \sigma)g \propto r^2$$

$$= 6\pi\eta r v_T \times v_T$$

$$\Rightarrow \frac{dQ}{dt} \propto r v_T^2 \propto r^5$$

9. $Q = 54 \text{ cal} = 54 \times 4.18 \text{ joule} = 225.72 \text{ joule}$

$$W = P[V_{\text{steam}} - V_{\text{water}}]$$

$$[\text{For water } 0.1 \text{ gram} = 0.1 \text{ cc}]$$

$$= 1.013 \times 10^5 [167.1 \times 10^{-6} - 0.1 \times 10^{-6}] \text{ joule}$$

$$= 1.013 \times 167 \times 10^{-1} = 16.917 \text{ joule}$$

By FLOT

$$\Rightarrow \Delta U = Q - W = 225.72 - 16.917 = 208.8 \text{ joule}$$

10. $Y = \frac{F\ell}{A\Delta\ell} \quad \because V = A\ell \quad \text{so } \ell = \frac{V}{A}$

$$\text{So } F = \frac{YA\Delta\ell}{\ell} = \frac{YA^2\Delta\ell}{V} \propto A^2$$

$$\frac{F_1}{F_2} = \left(\frac{A_1}{A_2}\right)^2 \Rightarrow \frac{F}{F_2} = \left(\frac{A}{3A}\right)^2 = \frac{1}{9}$$

$$\Rightarrow F_2 = 9F$$

11. $P = \sigma AT^4 \Rightarrow P \propto T^4$

$$\text{According to Wein's law } T \propto \frac{1}{\lambda_m}$$

$$\Rightarrow P \propto \left(\frac{1}{\lambda_m}\right)^4 \Rightarrow \frac{P_2}{P_1} = \left(\frac{\lambda_{m1}}{\lambda_{m2}}\right)^4$$

$$\Rightarrow \frac{P_2}{P_1} = \left(\frac{\lambda_0}{\frac{3}{4}\lambda_0}\right)^4 \Rightarrow \frac{nP}{P} = \frac{256}{81} \Rightarrow n = \frac{256}{81}$$

12. $I = \frac{E}{nR + R} \quad \dots (1)$

$$10I = \frac{E}{\frac{R}{n} + R} = \frac{nE}{R + nR} \quad \dots (2)$$

From (1) & (2),

$$n \frac{E}{R + nR} = 10 \left(\frac{E}{nR + R} \right) \Rightarrow n = 10$$

13. $I = \frac{nE}{nR} = \frac{E}{R} = \text{constant}$

14. $R = (47 \pm 4.7) \times 10^3 = 47 \times 10^3 \pm 10\% \Omega$

As per color code, 4 - Yellow, 7 - Violet, 3 - Orange, 10% - Silver

15. Coefficient of sliding friction has no dimension

16. By conservation of linear momentum

$$mv = 4mv' \Rightarrow v' = \frac{v}{4}$$

$$(e) = \frac{\text{Velocity of separation}}{\text{Velocity of approach}}$$

coefficient of restitution

$$= \frac{\frac{v}{4} - 0}{v - 0} = \frac{1}{4} = 0.25$$

17. To complete a vertical circle, speed at A should be

$$v_A = \sqrt{5gR} = \sqrt{\frac{5gD}{2}}$$

using energy conservation

$$mgh = \frac{1}{2}mv_A^2$$

$$h = \frac{1}{2} \frac{v_A^2}{g} = \frac{1}{2} \frac{5gD}{2g} = \frac{5D}{4} \quad \left(R = \frac{D}{2}\right)$$

18. $W = \text{loss in KE} = \frac{1}{2}I\omega^2 \propto I$

$$I_A = \frac{2}{5}MR^2 = 0.4MR^2$$

$$I_B = \frac{1}{2}MR^2 = 0.5MR^2$$

$$I_C = MR^2$$

$$\therefore W_C > W_B > W_A$$

19. $V = 2f(\ell_2 - \ell_1)$

$$= 2(320) \times (0.73 - 0.20)$$

$$= (640) \times (0.53) = 339.2 \text{ m/s}$$

20. $S = ut + \frac{1}{2}at^2$

$$h = 0 + \frac{1}{2} \left(\frac{qE}{m} \right) t^2 \Rightarrow t = \sqrt{\frac{2hm}{qE}} \Rightarrow t \propto \sqrt{m}$$

as mass of proton is heavier than electron, hence electron will take less time.

21. $|a| = \omega^2 x$

$$\Rightarrow 20 = \omega^2 5$$

$$\Rightarrow \omega^2 = 4$$

$$\Rightarrow \omega = 2 \Rightarrow \frac{2\pi}{T} = 2$$

$$\Rightarrow T = \pi \text{ s}$$

22. $F = QE = Q \frac{\sigma}{2\epsilon_0} = \frac{Q^2}{2A\epsilon_0}$

\therefore Electrostatic force is independent of distance between plates

23. $\vec{a} = \frac{\vec{F}}{m} = \frac{q\vec{E}}{m} = \frac{(-e)(-E_0)\hat{i}}{m} = \frac{eE_0}{m}\hat{i}$

$$V = V_0 + \frac{eE_0}{m}t$$

$$\lambda = \frac{h}{mv} = \frac{h}{m \left[V_0 + \frac{eE_0 t}{m} \right]}$$

$$= \frac{h}{mV_0 \left[1 + \frac{eE_0 t}{mV_0} \right]} = \frac{\lambda_0}{1 + \frac{eE_0 t}{mV_0}}$$

24. Number of nuclei remaining = $600 - 450 = 150$

$$\frac{N}{N_0} = \left(\frac{1}{2} \right)^{t/T_H} \Rightarrow \frac{150}{600} = \left(\frac{1}{2} \right)^{t/10}$$

$$\Rightarrow \frac{1}{4} = \left(\frac{1}{2} \right)^{t/10} \Rightarrow \left(\frac{1}{2} \right)^2 = \left(\frac{1}{2} \right)^{t/10}$$

$$\Rightarrow 2 = \frac{t}{10} \Rightarrow t = 20 \text{ min}$$

25. From Einstein's equation of PEE

$$\frac{1}{2}mv_1^2 = 2h\nu_0 - h\nu_0 \Rightarrow \frac{1}{2}mv_1^2 = h\nu_0 \dots(1)$$

$$\frac{1}{2}mv_2^2 = 5h\nu_0 - h\nu_0 \Rightarrow \frac{1}{2}mv_2^2 = 4h\nu_0 \dots(2)$$

$$(1) \div (2)$$

$$\frac{v_1^2}{v_2^2} = \frac{1}{4} \Rightarrow \frac{v_1}{v_2} = \sqrt{\frac{1}{4}} = \frac{1}{2}$$

$$\frac{KE}{E_{\text{Total}}} = \frac{1}{-1}$$

26. $E_{\text{total}} = -KE \Rightarrow \frac{KE}{E_{\text{Total}}} = \frac{1}{-1}$

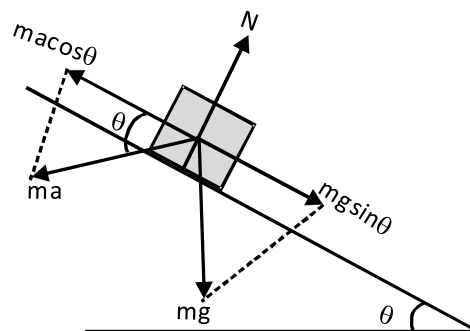
27. Here $\vec{F} = 4\hat{i} + 5\hat{j} - 6\hat{k}$ and

$$= \vec{r} = (2-2)\hat{i} + (0-(-2))\hat{j} + (-3-(-2))\hat{k}$$

$$= 2\hat{j} - 1\hat{k}$$

$$\vec{r} \times \vec{F} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 0 & 2 & -1 \\ 4 & 5 & -6 \end{vmatrix} = -7\hat{i} - 4\hat{j} - 8\hat{k}$$

28. FBD w.r.t. wedge



$$macos\theta = mg\sin\theta \Rightarrow a = g \tan \theta$$

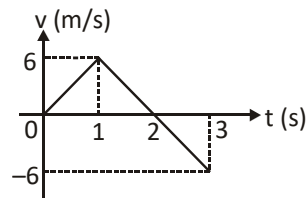
29. $0 < t < 1\text{ s}$: velocity increases from 0 to 6 m/s

$1 < t < 2\text{ s}$: velocity decreases from 6 to 0 m/s but car continues to move forward

$2 < t < 3\text{ s}$: since field strength is same

\Rightarrow same acceleration

\therefore car's velocity increases from 0 to -6 m/s



Distance travelled in first second

$$S = \left(\frac{u+v}{2} \right) t = \left(\frac{0+6}{2} \right) (1) = 3 \text{ m}$$

Total distance = 9 m so average speed

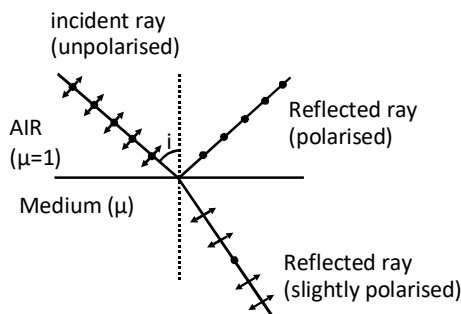
$$= \frac{9\text{m}}{3\text{s}} = 3 \text{ m/s}$$

Displacement = 3m so average velocity

$$= \frac{3\text{m}}{3\text{s}} = 1 \text{ m/s}$$

30. Reading of screw gauge
 $= \text{MSR} + \text{VSR} \times \text{LC} + \text{zero error}$
 $= 0.5 \text{ cm} + 25 \times 0.001 \text{ cm} + 0.004 \text{ cm}$
 $= 0.529 \text{ cm}$
31. When reflected and refracted rays are perpendicular, reflected light is polarised with electric field vector perpendicular to the plane of incidence.

$\tan i = \mu$ where i = Brewster's angle or polarisation angle



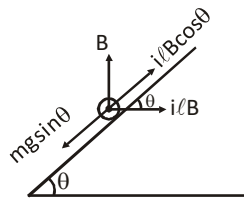
32. Angular width, $\theta = \frac{\lambda}{d} \Rightarrow \frac{\theta_1}{\theta_2} = \frac{d_2}{d_1}$
 $\frac{0.20}{0.21} = \frac{d_2}{2} \Rightarrow d_2 = \frac{0.20}{0.21} \times 2 = 1.9 \text{ mm}$
33. For astronomical refracting telescope
 Angular magnification $\left(\frac{f_o}{f_e} \right)$ is more for large focal length of objective lens
 Angular resolution or Resolving power
 $= \frac{d}{1.22 \lambda}$
 Resolving power is high for large diameter.
34. $V \propto T \Rightarrow W = P\Delta V = \mu R\Delta T$
 $Q = \mu C_p \Delta T$
 for mono atomic gas $f = 3$
 $C_p = \left(\frac{f}{2} R + R \right) = \frac{5}{2} R$ So $\frac{W}{Q} = \frac{\mu R \Delta T}{\mu C_p \Delta T} = \frac{2}{5}$
35. $f_{\text{oop}} = 3f_{\text{cop}} \Rightarrow \frac{v}{2\ell_{\text{oop}}} = \frac{3v}{4\ell_{\text{cop}}}$
 $\Rightarrow \ell_{\text{oop}} = \frac{2}{3} \times \ell_{\text{cop}} = \frac{2}{3} \times 20 = 13.3 \text{ cm}$
36. $\eta = \left(\frac{T_1 - T_2}{T_1} \right) \times 100$
 where $T_1 = 373 \text{ K}$, $T_2 = 273 \text{ K}$
 $\Rightarrow \eta = \frac{100}{373} \times 100 = 26.8\%$

37. $v_{\text{es}} = v_{\text{rms}}$

$$\Rightarrow 11.2 \times 10^3 = \sqrt{\frac{3kT}{m}}$$

$$\Rightarrow T = \frac{(11.2 \times 10^3)^2 m}{3k} = \frac{(11.2 \times 10^3)^2 (2.76 \times 10^{-26})}{3 \times 1.38 \times 10^{-23}}$$

$$\Rightarrow T = 8.360 \times 10^4 \text{ K}$$



38.

$$i l B \cos \theta = mg \sin \theta$$

$$i = \frac{mg}{lB} \tan \theta = \left(\frac{m}{l} \right) \frac{g \tan \theta}{B}$$

$$i = 0.5 \times \frac{9.8}{0.25} \times \frac{1}{\sqrt{3}} = 11.3 \text{ amp.}$$

39. Here

$$X_L = \omega L = (314) (20 \times 10^{-3}) = 6.280$$

$$X_C = \frac{1}{\omega C} = \frac{1}{314 \times 100 \times 10^{-6}} = 31.84 \Omega$$

$$R = 50 \Omega$$

$$Z = \sqrt{(X_C - X_L)^2 + R^2}$$

$$= \sqrt{(31.84 - 6.28)^2 + (50)^2} = 56 \Omega$$

$$P = \left(\frac{v_{\text{rms}}^2}{Z} \right) R = \left(\frac{\left(\frac{10}{\sqrt{2}} \right)^2}{(56)^2} \right) \times 50 = 0.79 \text{ W}$$

40. When current source is switched on, magnetic field sets up between poles on electromagnet. Diamagnetic material, due to its tendency to move from stronger to weaker field, is thus repelled out.
41. $\frac{\theta}{i} = \frac{50}{10^{-3}} = 5000$, $\frac{\theta}{V} = 20$
 $\Rightarrow \frac{\theta/i}{\theta/V} = \frac{5000}{10} = 250$
 $\Rightarrow \frac{V}{i} = R = 250 \Omega$

42. $m'_s = \frac{m_s}{10}$ & $G' = 10 G$

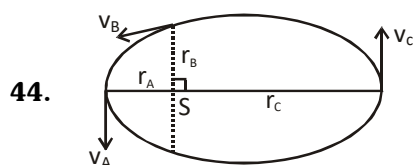
$$g_E = \frac{G' M_E}{R^2} = \frac{10 G M_E}{R^2} = 10 g$$

∴ Raindrops will fall faster, Walking on the ground would become more difficult, Time period of a simple pendulum on the earth would decrease.

43. $K_t = \frac{1}{2} m v^2$

$$K_t + K_r = \frac{1}{2} m v^2 \left(1 + \frac{K^2}{R^2} \right) = \frac{1}{2} m v^2 \left(1 + \frac{2}{5} \right)$$

$$\therefore \frac{K_t}{K_t + K_r} = \frac{1/2 m v^2}{1/2 m v^2 \left(1 + \frac{2}{5} \right)} = \frac{5}{7}$$



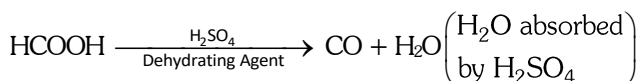
As $L = mvr = \text{constant}$

and $r_C > r_B > r_A$

so $v_A > v_B > v_C \Rightarrow K_A > K_B > K_C$

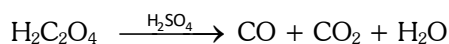
45. $\tau_{\text{ext}} = 0 \Rightarrow \frac{dL}{dt} = 0 \Rightarrow L = \text{constant}$

46.



$$(\text{moles})_i = \frac{2.3}{46} = \frac{1}{20} \quad 0 \quad 0$$

$$(\text{moles})_f \quad 0 \quad \frac{1}{20} \quad \frac{1}{20}$$



[H₂O absorbed by H₂SO₄]

$$(\text{moles})_i \quad \frac{4.5}{90} = \frac{1}{20} \quad 0 \quad 0 \quad 0$$

$$(\text{moles})_f \quad 0 \quad \frac{1}{20} \quad \frac{1}{20} \quad \frac{1}{20}$$

CO₂ is absorbed by KOH.

So the remaining product is only CO.

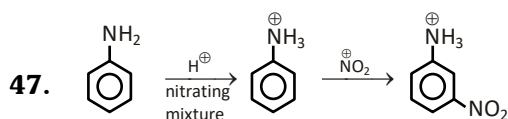
moles of CO formed from both reactions

$$= \frac{1}{20} + \frac{1}{20} = \frac{1}{10}$$

Left mass of CO = moles × molar mass

$$= \frac{1}{10} \times 28$$

$$= \boxed{2.8 \text{ g}} \text{ Ans.}$$

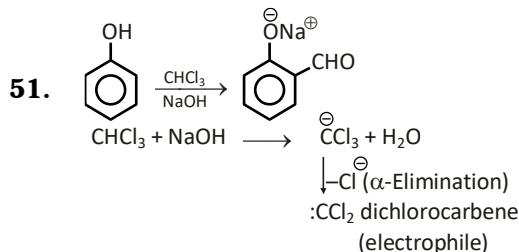


In acidic medium aniline is protonated to form anilinium ion which is meta directing.

48. In metals moving down the group metallic character increases, so basic nature increases hence most acidic will be BeO.

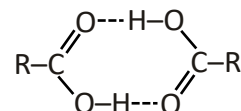
49. Amylose is long unbranched chain with α-D-Glucose with held by C₁-C₄ glycosidic linkage whereas amylopectin is branched chain polymer of α-D glucose unit in which chain is formed by C₁-C₄ glycosidic linkage while branching occurs by C₁-C₆ glucosidic linkage.

50. Cross-linked or network polymers are usually formed from bi-functional & tri-functional monomers and contains strong covalent bond between various linear polymer chains like Melamine, Bakelite etc.

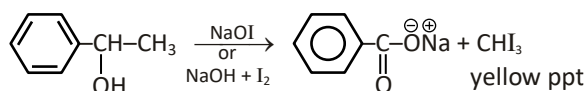


52. Carboxylic acid has higher boiling point than aldehyde, ketone and even alcohols of comparable molecular mass.

This is due to more extensive association through intermolecular H-bonding.



53. Haloform reaction is shown by compound having $\text{CH}_3\text{C}(=\text{O})\text{—}$ or $\text{CH}_3\text{—CH}(\text{OH})\text{—}$ Group



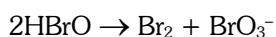
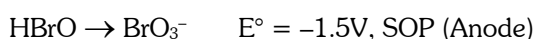
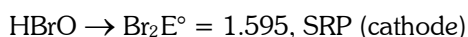
- 54.
- $(t_{1/2})^{1st}$
- order = Independent of Concentration

$$(t_{1/2})^{2nd} \text{ order} \propto \frac{1}{[A]_0}$$

- 55.
- $\text{BeH}_2 < \text{CaH}_2 < \text{BaH}_2$

Smaller the size of cation, more will be its polarising power. Hence BeH_2 will be least ionic.

56. Calculate
- E°_{cell}
- corresponding to each compound under going disproportionation reaction. The reaction for which
- E°_{cell}
- comes out +ve is spontaneous.



$$E^\circ_{\text{cell}} = \text{SRP (cathode)} - \text{SRP (Anode)} \\ = 1.595 - 1.5 = 0.095 \text{ V}$$

$$E^\circ_{\text{cell}} > 0 \Rightarrow \Delta G^\circ < 0 \text{ [spontaneous]}$$

57. (1) 18 mL water

$$\text{As } d_{\text{H}_2\text{O}} = 1 \text{ g/mL} \quad \text{So } W_{\text{H}_2\text{O}} = 18\text{g}$$

$$n_{\text{H}_2\text{O}} = \frac{18}{18} = 1$$

$$\text{molecules} = 1 \times N_A$$

- (2) 0.18 g of water

$$n_{\text{H}_2\text{O}} = \frac{0.18}{18} = 0.01$$

$$(\text{molecules})_{\text{H}_2\text{O}} = 0.01 \times N_A$$

- (3)
- $(V_{\text{H}_2\text{O(g)}})_{\text{STP}} = 0.00224 \text{ L}$

$$n_{\text{H}_2\text{O}} = \frac{V}{22.4} = \frac{0.00224}{22.4} = 0.0001$$

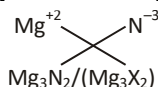
$$\text{molecules} = 0.0001 \times N_A$$

- (4)
- $n_{\text{H}_2\text{O}} = 10^{-3}$

$$(\text{molecules})_{\text{H}_2\text{O}} = 10^{-3} \times N_A$$

58. Magnesium ion =
- Mg^{+2}

X = Nitrogen

Nitrogen ion = N^{-3} 

59. BCC

FCC

$$4r = \sqrt{3}a$$

$$4r = \sqrt{2}a$$

$$a = \frac{4r}{\sqrt{3}}$$

$$a = \frac{4r}{\sqrt{2}}$$

$$\frac{d_{\text{BCC}}}{d_{\text{FCC}}} = \frac{\frac{Z_{\text{BCC}} \times M}{N_A a^3}}{\frac{Z_{\text{FCC}} \times M}{N_A a^3}} = \frac{\frac{2 \times M}{N_A \left(\frac{4r}{\sqrt{3}}\right)^3}}{\frac{4 \times M}{N_A \left(\frac{4r}{\sqrt{2}}\right)^3}} = \frac{3}{4} \sqrt{\frac{3}{2}}$$

60. The correct configuration of 'N' is



61. Ion/Species Total electron Bond order

$$\text{NO} \quad 15 \quad 2.5$$

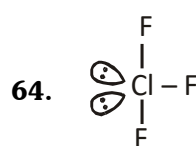
$$\text{CN}^- \quad 14 \quad 3$$

$$\text{CN}^+ \quad 12 \quad 2$$

$$\text{CN} \quad 13 \quad 2.5$$

- 63.
- MF_6^{-3}

Boron belongs to 2nd period and it does not have vacant d-orbital.



2 lone pair at equatorial position.

65. Mg has more
- $-\Delta G$
- value than alumina. So it will be in the lower part of Ellingham diagram. Metals which has more
- $-\Delta G$
- value can reduce those metals oxide which has less
- $-\Delta G$
- value.

66. In group 13 due to transition contraction
- $[\text{Al} > \text{Ga}]$

- 67.
- $\text{HNO}_3^{+5}, \text{NO}^{+2}, \text{N}_2^0, \text{NH}_4\text{Cl}^{-3}$

68. According to Hardy Schulze rule : The coagulating power of an ion depend on both magnitude and sign of the charge of the ion.

69. As
- $N_1V_1 > N_2V_2$

So acid is left at the end of reaction

$$N_{\text{final solution}} = [\text{H}^+] = \frac{N_1V_1 - N_2V_2}{V_1 + V_2} \\ = \frac{\frac{1}{5} \times 75 - \frac{1}{5} \times 25}{75 + 25} = \frac{1}{10} = 0.1$$

$$\text{pH} = -\log[\text{H}^+] = 1$$

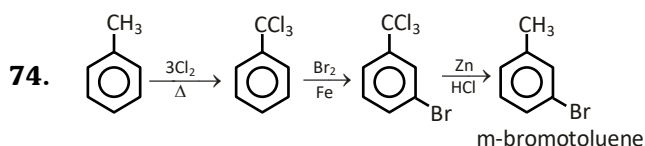
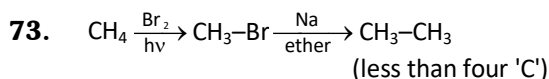
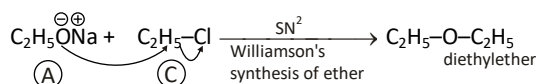
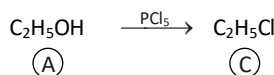
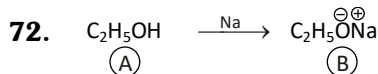
70. Solubility of
- $\text{BaSO}_4 = 2.42 \times 10^{-3} \text{ gL}^{-1}$

$$\therefore s = \frac{2.42 \times 10^{-3}}{233} = 1.038 \times 10^{-5} \text{ mol L}^{-1}$$

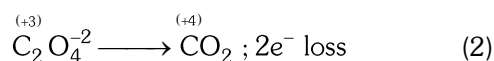
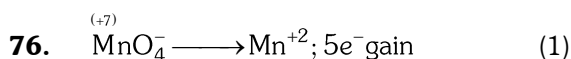
$$K_{\text{sp}} = s^2 = (1.038 \times 10^{-5})^2 \\ = 1.08 \times 10^{-10} \text{ mol}^2 \text{ L}^{-2}$$

71. Critical temperature \propto vanderwaal constant(a)

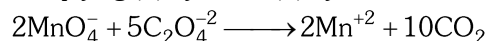
maximum "a" \Rightarrow gas with maximum
 $T_c \Rightarrow$ easiest liquification = NH_3



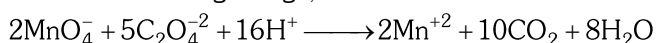
75. Nitrous oxide (N_2O) occurs naturally in environment.
In automobile engine, when fossil is burnt dinitrogen & dioxygen combine to yield NO & NO_2 .



multiplying (1) by 2 and (2) by 5 to balance e^-



on balancing charge;



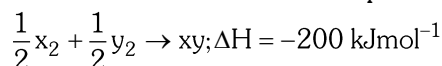
77. For reaction $\Delta H = -ve$ and $\Delta n_g = -ve$
 \therefore High P, Low T, favour product formation.

78. Vanderwaal constant (a) \propto forces of attraction.

79. $(t_{1/2})_{\text{zero}} = \frac{[A]_0}{2K}$

\therefore If $[A]_0$ = doubled, $t_{1/2}$ = doubled

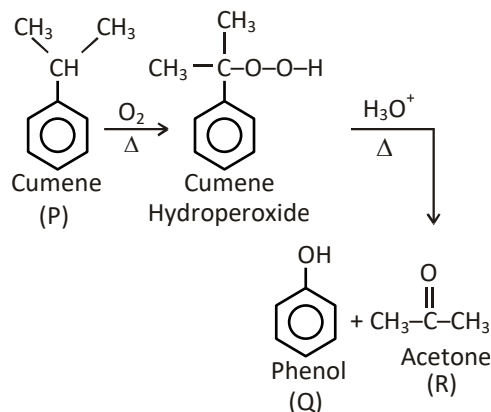
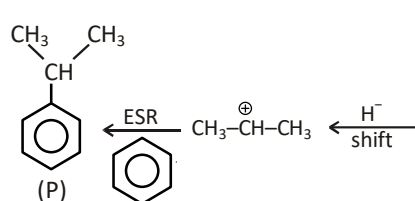
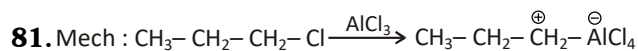
80. Let B.E. of x_2 , y_2 & xy are $x \text{ kJ mol}^{-1}$, $0.5x \text{ kJ mol}^{-1}$ and $x \text{ kJ mol}^{-1}$ respectively



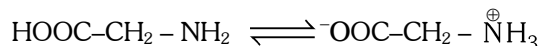
$\Delta H = -200 = \sum(\text{B.E.})_{\text{Reactant}} - \sum(\text{B.E.})_{\text{Product}}$

$= \left[\frac{1}{2} \times (x) + \frac{1}{2} \times (0.5x) \right] - [1 \times (x)]$

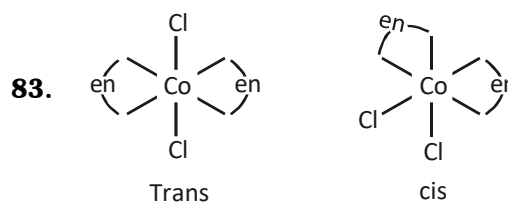
B.E of $X_2 = x = 800 \text{ kJ mol}^{-1}$



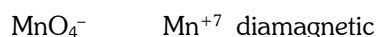
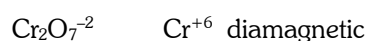
82. The molecule which forms zwitter ion is glycine.



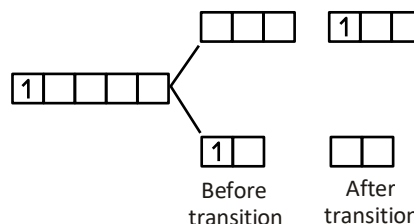
Zwitter ion



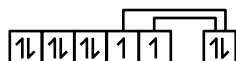
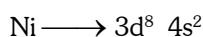
84. CrO_4^{2-} Cr^{+6} diamagnetic



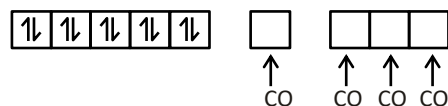
unpaired electron is present so d-d transition is possible.



85. Tetrahedral geometry and diamagnetic



CO is SFL so unpaired electrons will get paired.



sp^3 hybridisation

Tetrahedral, diamagnetic

- 86.
- $\text{Fe}(\text{CO})_5$

$$\text{EAN} = Z - \text{O.N.} + 2(\text{C.N.})$$

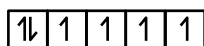
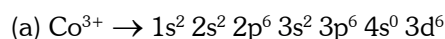
$$= 26 - 0 + 2(5)$$

$$= 26 + 10$$

$$= 36$$

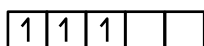
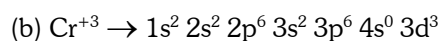
only one central metal atom/ion is present and it follows EAN rule, so it is mononuclear

87. Magnetic moment (
- μ
-) =
- $\sqrt{n(n+2)}$
- B.M.



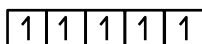
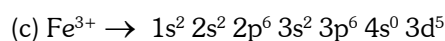
$$n = 4$$

$$\mu = \sqrt{4(4+2)} = \sqrt{24} \text{ B. M.}$$



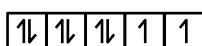
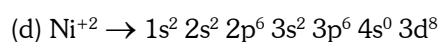
$$n = 3$$

$$\mu = \sqrt{3(3+2)} = \sqrt{15} \text{ B.M.}$$



$$n = 5$$

$$\mu = \sqrt{5(5+2)} = \sqrt{35} \text{ B. M.}$$



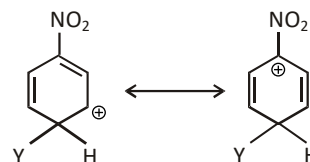
$$n = 2$$

$$\mu = \sqrt{2(2+2)} = \sqrt{8} \text{ B. M.}$$

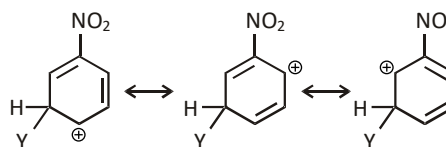
88. (Based on EN)



- 89.
- $-\text{NO}_2$
- group is meta-directing group

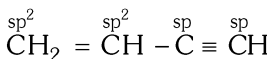


(Less stable due to more e^- withdrawing effect of $-\text{NO}_2$)



(More stable due to less e^- withdrawing effect of $-\text{NO}_2$)

- 90.
- $\text{CH}_2 = \text{CH} - \text{C} \equiv \text{CH}$



NEET(UG) – 2017

1. A spring of force constant k is cut into lengths of ratio $1 : 2 : 3$. They are connected in series and the new force constant is k' . Then they are connected in parallel and force constant is k'' . Then $k' : k''$ is :-

- (1) $1 : 9$ (2) $1 : 11$
(3) $1 : 14$ (4) $1 : 16$

2. The ratio of resolving powers of an optical microscope for two wavelengths $\lambda_1 = 4000 \text{ \AA}$ and $\lambda_2 = 6000 \text{ \AA}$ is :-

- (1) $9 : 4$ (2) $3 : 2$
(3) $16 : 81$ (4) $8 : 27$

3. The two nearest harmonics of a tube closed at one end and open at other end are 220 Hz and 260 Hz . What is the fundamental frequency of the system?

- (1) 20 Hz (2) 30 Hz
(3) 40 Hz (4) 10 Hz

4. Consider a drop of rain water having mass 1 g falling from a height of 1 km . It hits the ground with a speed of 50 m/s . Take 'g' constant with a value 10 m/s^2 . The work done by the (i) gravitational force and the (ii) resistive force of air is :-

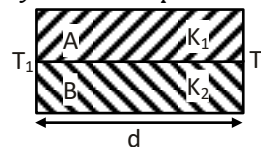
- (1) (i) 1.25 J (ii) -8.25 J
(2) (i) 100 J (ii) 8.75 J
(3) (i) 10 J (ii) -8.75 J
(4) (i) -10 J (ii) -8.25 J

5. A physical quantity of the dimensions of length that can be formed out of c , G and $\frac{e^2}{4\pi\epsilon_0}$ is [c is

velocity of light, G is universal constant of gravitation and e is charge] :-

- (1) $c^2 \left[G \frac{e^2}{4\pi\epsilon_0} \right]^{1/2}$ (2) $\frac{1}{c^2} \left[\frac{e^2}{G 4\pi\epsilon_0} \right]^{1/2}$
(3) $\frac{1}{c} G \frac{e^2}{4\pi\epsilon_0}$ (4) $\frac{1}{c^2} \left[G \frac{e^2}{4\pi\epsilon_0} \right]^{1/2}$

6. Two rods A and B of different materials are welded together as shown in figure. Their thermal conductivities are K_1 and K_2 . The thermal conductivity of the composite rod will be:



- (1) $\frac{3(K_1 + K_2)}{2}$ (2) $K_1 + K_2$
(3) $2(K_1 + K_2)$ (4) $\frac{K_1 + K_2}{2}$

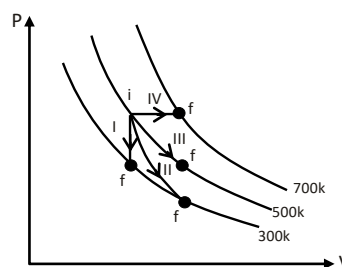
7. A capacitor is charged by a battery. The battery is removed and another identical uncharged capacitor is connected in parallel. The total electrostatic energy of resulting system:-

- (1) Decreases by a factor of 2
(2) Remains the same
(3) Increases by a factor of 2
(4) Increases by a factor of 4

8. In a common emitter transistor amplifier the audio signal voltage across the collector is 3 V . The resistance of collector is $3 \text{ k}\Omega$. If current gain is 100 and the base resistance is $2 \text{ k}\Omega$, the voltage and power gain of the amplifier is :-

- (1) 15 and 200 (2) 150 and 15000
(3) 20 and 2000 (4) 200 and 1000

9. Thermodynamic processes are indicated in the following diagram :



Match the following

Column-1	Column-2
P. Process I	a. Adiabatic
Q. Process II	b. Isobaric
R. Process III	c. Isochoric
S. Process IV	d. Isothermal
(1) $P \rightarrow c$, $Q \rightarrow a$, $R \rightarrow d$, $S \rightarrow b$	
(2) $P \rightarrow c$, $Q \rightarrow d$, $R \rightarrow b$, $S \rightarrow a$	
(3) $P \rightarrow d$, $Q \rightarrow b$, $R \rightarrow a$, $S \rightarrow c$	
(4) $P \rightarrow a$, $Q \rightarrow c$, $R \rightarrow d$, $S \rightarrow b$	

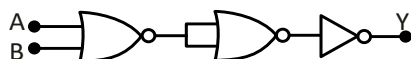
10. Suppose the charge of a proton and an electron differ slightly. One of them is $-e$, the other is $(e + \Delta e)$. If the net of electrostatic force and gravitational force between two hydrogen atoms placed at a distance d (much greater than atomic size) apart is zero, then Δe is of the order of
[Given mass of hydrogen $m_h = 1.67 \times 10^{-27}$ kg]

(1) 10^{-23} C (2) 10^{-37} C
(3) 10^{-47} C (4) 10^{-20} C

11. The resistance of a wire is 'R' ohm. If it is melted and stretched to 'n' times its original length, its new resistance will be :-

(1) $\frac{R}{n}$ (2) $n^2 R$ (3) $\frac{R}{n^2}$ (4) nR

12. The given electrical network is equivalent to :



(1) OR gate (2) NOR gate
(3) NOT gate (4) AND gate

13. The de-Broglie wavelength of a neutron in thermal equilibrium with heavy water at a temperature T (Kelvin) and mass m , is :-

(1) $\frac{h}{\sqrt{3mkT}}$ (2) $\frac{2h}{\sqrt{3mkT}}$
(3) $\frac{2h}{\sqrt{mkT}}$ (4) $\frac{h}{\sqrt{mkT}}$

14. Which one of the following represents forward bias diode ?

(1) (2)
(3) (4)

15. A long solenoid of diameter 0.1 m has 2×10^4 turns per meter. At the centre of the solenoid, a coil of 100 turns and radius 0.01 m is placed with its axis coinciding with the solenoid axis. The current in the solenoid reduces at a constant rate to 0A from 4 A in 0.05 s. If the resistance of the coil is $10\pi^2 \Omega$, the total charge flowing through the coil during this time is :-

(1) $16 \mu C$ (2) $32 \mu C$
(3) $16 \pi \mu C$ (4) $32 \pi \mu C$

16. Preeti reached the metro station and found that the escalator was not working. She walked up the stationary escalator in time t_1 . On other days, if she remains stationary on the moving escalator, then the escalator takes her up in time t_2 . The time taken by her to walk up on the moving escalator will be

(1) $\frac{t_1 t_2}{t_2 - t_1}$ (2) $\frac{t_1 t_2}{t_2 + t_1}$
(3) $t_1 - t_2$ (4) $\frac{t_1 + t_2}{2}$

17. Young's double slit experiment is first performed in air and then in a medium other than air. It is found that 8th bright fringe in the medium lies where 5th dark fringe lies in air. The refractive index of the medium is nearly :-

(1) 1.59 (2) 1.69 (3) 1.78 (4) 1.25

18. A beam of light from a source L is incident normally on a plane mirror fixed at a certain distance x from the source. The beam is reflected back as a spot on a scale placed just above the source I. When the mirror is rotated through a small angle θ , the spot of the light is found to move through a distance y on the scale. The angle θ is given by :-

(1) $\frac{y}{x}$ (2) $\frac{x}{2y}$ (3) $\frac{x}{y}$ (4) $\frac{y}{2x}$

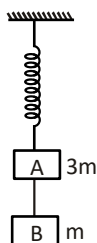
19. If θ_1 and θ_2 be the apparent angles of dip observed in two vertical planes at right angles to each other, then the true angle of dip θ is given by :-

(1) $\tan^2 \theta = \tan^2 \theta_1 + \tan^2 \theta_2$
(2) $\cot^2 \theta = \cot^2 \theta_1 - \cot^2 \theta_2$
(3) $\tan^2 \theta = \tan^2 \theta_1 - \tan^2 \theta_2$
(4) $\cot^2 \theta = \cot^2 \theta_1 + \cot^2 \theta_2$

20. Two cars moving in opposite directions approach each other with speed of 22 m/s and 16.5 m/s respectively. The driver of the first car blows a horn having a frequency 400 Hz. The frequency heard by the driver of the second car is [velocity of sound 340 m/s] :-

(1) 361 Hz (2) 411 Hz
(3) 448 Hz (4) 350 Hz

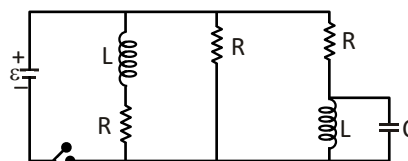
21. Two blocks A and B of masses $3m$ and m respectively are connected by a massless and inextensible string. The whole system is suspended by a massless spring as shown in figure. The magnitudes of acceleration of A and B immediately after the string is cut, are respectively :-



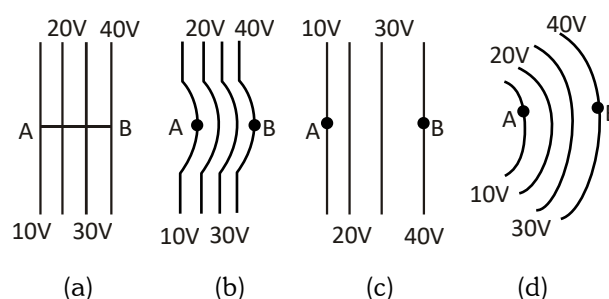
- (1) $\frac{g}{3}, g$ (2) g, g
(3) $\frac{g}{3}, \frac{g}{3}$ (4) $g, \frac{g}{3}$
22. A thin prism having refracting angle 10° is made of glass of refractive index 1.42. This prism is combined with another thin prism of glass of refractive index 1.7. This combination produces dispersion without deviation. The refracting angle of second prism should be :-
(1) 6° (2) 8°
(3) 10° (4) 4°
23. The acceleration due to gravity at a height 1 km above the earth is the same as at a depth d below the surface of earth. Then :-
(1) $d = 1$ km
(2) $d = \frac{3}{2}$ km
(3) $d = 2$ km
(4) $d = \frac{1}{2}$ km
24. A potentiometer is an accurate and versatile device to make electrical measurements of E.M.F. because the method involves :-
(1) Potential gradients
(2) A condition of no current flow through the galvanometer
(3) A combination of cells, galvanometer and resistances
(4) Cells

25. A spherical black body with a radius of 12 cm radiates 450 watt power at 500 K. If the radius were halved and the temperature doubled, the power radiated in watt would be :-
(1) 450 (2) 1000
(3) 1800 (4) 225

26. Figure shows a circuit that contains three identical resistors with resistance $R = 9.0 \Omega$ each, two identical inductors with inductance $L = 2.0$ mH each, and an ideal battery with emf $\mathcal{E} = 18$ V. The current 'i' through the battery just after the switch closed is,..... :-



- (1) 0.2 A (2) 2 A
(3) 0 ampere (4) 2 mA
27. Radioactive material 'A' has decay constant ' 8λ ' and material 'B' has decay constant ' λ '. Initially they have same number of nuclei. After what time, the ratio of number of nuclei of material 'B' to that 'A' will be $\frac{1}{e}$?
(1) $\frac{1}{7\lambda}$ (2) $\frac{1}{8\lambda}$ (3) $\frac{1}{9\lambda}$ (4) $\frac{1}{\lambda}$
28. The diagrams below show regions of equipotentials:-

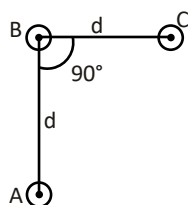


A positive charge is moved from A to B in each diagram.

- (1) In all the four cases the work done is the same
(2) Minimum work is required to move q in figure (a)
(3) Maximum work is required to move q in figure (b)
(4) Maximum work is required to move q in figure (c)

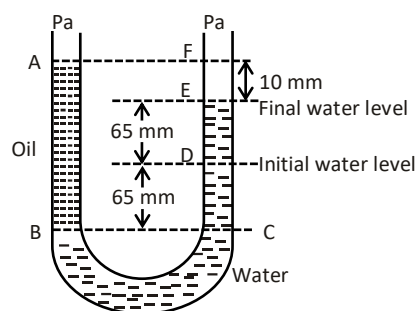
- 29.** Two astronauts are floating in gravitational free space after having lost contact with their spaceship. The two will :-
 (1) Move towards each other.
 (2) Move away from each other.
 (3) Will become stationary
 (4) Keep floating at the same distance between them.
- 30.** The x and y coordinates of the particle at any time are $x = 5t - 2t^2$ and $y = 10t$ respectively, where x and y are in meters and t in seconds. The acceleration of the particle at $t = 2s$ is :-
 (1) 5 m/s^2 (2) -4 m/s^2
 (3) -8 m/s^2 (4) 0
- 31.** One end of string of length l is connected to a particle of mass ' m ' and the other end is connected to a small peg on a smooth horizontal table. If the particle moves in circle with speed ' v ' the net force on the particle (directed towards centre) will be
 (T represents the tension in the string) :-
 (1) $T + \frac{mv^2}{l}$
 (2) $T - \frac{mv^2}{l}$
 (3) Zero
 (4) T
- 32.** A particle executes linear simple harmonic motion with an amplitude of 3 cm. When the particle is at 2 cm from the mean position, the magnitude of its velocity is equal to that of its acceleration. Then its time period in seconds is :-
 (1) $\frac{\sqrt{5}}{2\pi}$
 (2) $\frac{4\pi}{\sqrt{5}}$
 (3) $\frac{2\pi}{\sqrt{3}}$
 (4) $\frac{\sqrt{5}}{\pi}$
- 33.** Two Polaroids P_1 and P_2 are placed with their axis perpendicular to each other. Unpolarised light I_0 is incident on P_1 . A third polaroid P_3 is kept in between P_1 and P_2 such that its axis makes an angle 45° with that of P_1 . The intensity of transmitted light through P_2 is :-
 (1) $\frac{I_0}{4}$ (2) $\frac{I_0}{8}$
 (3) $\frac{I_0}{16}$ (4) $\frac{I_0}{2}$
- 34.** The bulk modulus of a spherical object is ' B '. If it is subjected to uniform pressure ' p ', the fractional decrease in radius is :-
 (1) $\frac{B}{3p}$ (2) $\frac{3p}{B}$
 (3) $\frac{p}{3B}$ (4) $\frac{p}{B}$
- 35.** In an electromagnetic wave in free space the root mean square value of the electric field is $E_{\text{rms}} = 6 \text{ V/m}$. The peak value of the magnetic field is :-
 (1) $2.83 \times 10^{-8} \text{ T}$ (2) $0.70 \times 10^{-8} \text{ T}$
 (3) $4.23 \times 10^{-8} \text{ T}$ (4) $1.41 \times 10^{-8} \text{ T}$
- 36.** A rope is wound around a hollow cylinder of mass 3 kg and radius 40 cm. What is the angular acceleration of the cylinder if the rope is pulled with a force of 30 N ?
 (1) 0.25 rad/s^2 (2) 25 rad/s^2
 (3) 5 m/s^2 (4) 25 m/s^2
- 37.** Two discs of same moment of inertia rotating about their regular axis passing through centre and perpendicular to the plane of disc with angular velocities ω_1 and ω_2 . They are brought into contact face to face coinciding the axis of rotation. The expression for loss of energy during this process is:-
 (1) $\frac{1}{4} I (\omega_1 - \omega_2)^2$ (2) $I (\omega_1 - \omega_2)^2$
 (3) $\frac{1}{8} I (\omega_1 - \omega_2)^2$ (4) $\frac{1}{2} I (\omega_1 + \omega_2)^2$

38. The photoelectric threshold wavelength of silver is $3250 \times 10^{-10} \text{ m}$. The velocity of the electron ejected from a silver surface by ultraviolet light of wavelength $2536 \times 10^{-10} \text{ m}$ is:-
(Given $h = 4.14 \times 10^{-15} \text{ eVs}$ and $c = 3 \times 10^8 \text{ ms}^{-1}$)
(1) $\approx 0.6 \times 10^6 \text{ ms}^{-1}$ (2) $\approx 61 \times 10^3 \text{ ms}^{-1}$
(3) $\approx 0.3 \times 10^6 \text{ ms}^{-1}$ (4) $\approx 6 \times 10^5 \text{ ms}^{-1}$
39. A 250-Turn rectangular coil of length 2.1 cm and width 1.25 cm carries a current of 85 μA and subjected to magnetic field of strength 0.85 T. Work done for rotating the coil by 180° against the torque is:-
(1) 4.55 μJ (2) 2.3 μJ
(3) 1.15 μJ (4) 9.1 μJ
40. The ratio of wavelengths of the last line of Balmer series and the last line of Lyman series is :-
(1) 1 (2) 4
(3) 0.5 (4) 2
41. A carnot engine having an efficiency of $\frac{1}{10}$ as heat engine, is used as a refrigerator. If the work done on the system is 10 J, the amount of energy absorbed from the reservoir at lower temperature is :-
(1) 90 J (2) 99 J
(3) 100 J (4) 1 J
42. A gas mixture consists of 2 moles of O_2 and 4 moles of Ar at temperature T. Neglecting all vibrational modes, the total internal energy of the system is :-
(1) 15 RT (2) 9 RT
(3) 11 RT (4) 4 RT
43. An arrangement of three parallel straight wires placed perpendicular to plane of paper carrying same current 'I' along the same direction is shown in fig. Magnitude of force per unit length on the middle wire 'B' is given by :-



- (1) $\frac{2\mu_0 i^2}{\pi d}$ (2) $\frac{\sqrt{2}\mu_0 i^2}{\pi d}$
(3) $\frac{\mu_0 i^2}{\sqrt{2}\pi d}$ (4) $\frac{\mu_0 i^2}{2\pi d}$

44. A U tube with both ends open to the atmosphere, is partially filled with water. Oil, which is immiscible with water, is poured into one side until it stands at a distance of 10 mm above the water level on the other side. Meanwhile the water rises by 65 mm from its original level (see diagram). The density of the oil is :-



- (1) 425 kg m^{-3} (2) 800 kg m^{-3}
(3) 928 kg m^{-3} (4) 650 kg m^{-3}
45. Which of the following statements are **correct**?
- (a) Centre of mass of a body always coincides with the centre of gravity of the body
(b) Central of mass of a body is the point at which the total gravitational torque on the body is zero
(c) A couple on a body produce both translational and rotation motion in a body
(d) Mechanical advantage greater than one means that small effort can be used to lift a large load
- (1) (a) and (b)
(2) (b) and (c)
(3) (c) and (d)
(4) (b) and (d)

46. Name the gas that can readily decolourise acidified KMnO_4 solution :

- (1) SO_2 (2) NO_2 (3) P_2O_5 (4) CO_2

47. Mechanism of a hypothetical reaction

$\text{X}_2 + \text{Y}_2 \rightarrow 2\text{XY}$ is given below :

(i) $\text{X}_2 \rightarrow \text{X} + \text{X}(\text{fast})$

(ii) $\text{X} + \text{Y}_2 \rightleftharpoons \text{XY} + \text{Y}(\text{slow})$

(iii) $\text{X} + \text{Y} \rightarrow \text{XY}(\text{fast})$

The overall order of the reaction will be :

- (1) 2 (2) 0 (3) 1.5 (4) 1

48. The element $Z = 114$ has been discovered recently. It will belong to which of the following family/group and electronic configuration?

- (1) Carbon family, $[\text{Rn}] 5f^{14} 6d^{10} 7s^2 7p^2$
 (2) Oxygen family, $[\text{Rn}] 5f^{14} 6d^{10} 7s^2 7p^4$
 (3) Nitrogen family, $[\text{Rn}] 5f^{14} 6d^{10} 7s^2 7p^6$
 (4) Halogen family, $[\text{Rn}] 5f^{14} 6d^{10} 7s^2 7p^5$

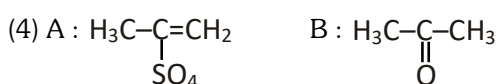
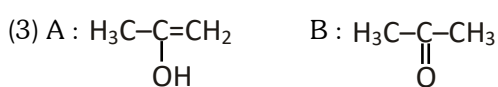
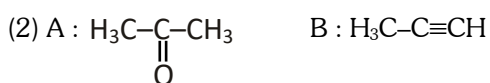
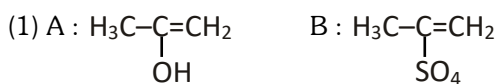
49. The heating of phenyl-methyl ethers with HI produces

- (1) iodobenzene (2) phenol
 (3) benzene (4) ethyl chlorides

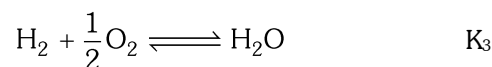
50. Which one is the correct order of acidity ?

- (1) $\text{CH} \equiv \text{CH} > \text{CH}_3 - \text{C} \equiv \text{CH} > \text{CH}_2 = \text{CH}_2 > \text{CH}_3 - \text{CH}_3$
 (2) $\text{CH} \equiv \text{CH} > \text{CH}_2 = \text{CH}_2 > \text{CH}_3 - \text{C} \equiv \text{CH} > \text{CH}_3 - \text{CH}_3$
 (3) $\text{CH}_3 - \text{CH}_3 > \text{CH}_2 = \text{CH}_2 > \text{CH}_3 - \text{C} \equiv \text{CH} > \text{CH} \equiv \text{CH}$
 (4) $\text{CH}_2 = \text{CH}_2 > \text{CH}_3 - \text{CH} = \text{CH}_2 > \text{CH}_3 - \text{C} \equiv \text{CH} > \text{CH} > \text{CH} \equiv \text{CH}$

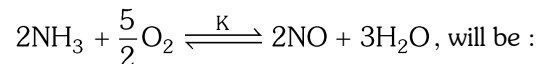
51. Predict the correct intermediate and product in the following reaction :



52. The equilibrium constant of the following are:

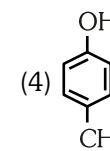
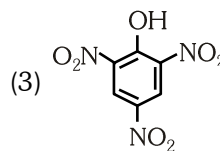
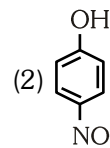
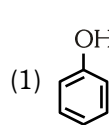


The equilibrium constant (K) of the reaction:

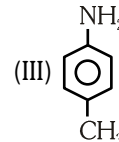
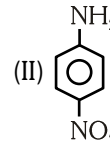
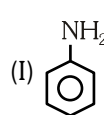


- (1) $K_2 K_3^3 / K_1$ (2) $K_2 K_3 / K_1$
 (3) $K_2^3 K_3 / K_1$ (4) $K_1 K_3^3 / K_2$

53. Which one is the most acidic compound ?



54. The **correct** increasing order of basic strength for the following compounds is :



- (1) $\text{III} < \text{I} < \text{II}$ (2) $\text{III} < \text{II} < \text{I}$
 (3) $\text{II} < \text{I} < \text{III}$ (4) $\text{II} < \text{III} < \text{I}$

55. Ionic mobility of which of the following alkali metal ions is lowest when aqueous solution of their salts are put under an electric field ?

- (1) K (2) Rb (3) Li (4) Na

56. The most suitable method of separation of 1 : 1 mixture of ortho and para-nitrophenols is :

- (1) Chromatography
 (2) Crystallisation
 (3) Steam distillation
 (4) Sublimation

57. HgCl_2 and I_2 both when dissolved in water containing I^- ions the pair of species formed is :

- (1) HgI_2, I^- (2) $\text{HgI}_4^{2-}, \text{I}_3^-$
 (3) $\text{Hg}_2\text{I}_2, \text{I}^-$ (4) $\text{HgI}_2, \text{I}_3^-$

58. Mixture of chloroxylenol and terpineol acts as:
 (1) antiseptic (2) antipyretic
 (3) antibiotic (4) analgesic
59. An example of a sigma bonded organometallic compound is :
 (1) Grignard's reagent (2) Ferrocene
 (3) Cobaltocene (4) Ruthenocene
60. A first order reaction has a specific reaction rate of 10^{-2} sec^{-1} . How much time will it take for 20g of the reactant to reduce to 5 g?
 (1) 138.6 sec (2) 346.5 sec
 (3) 693.0 sec (4) 238.6 sec
61. Match the interhalogen compounds of column-I with the geometry in column II and assign the correct code.

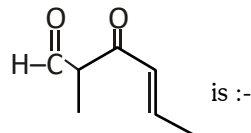
Column-I		Column-II	
(a)	XX'	(i)	T-shape
(b)	XX'_3	(ii)	Pentagonal bipyramidal
(c)	XX'_5	(iii)	Linear
(d)	XX'_7	(iv)	Square-pyramidal
		(v)	Tetrahedral

Code :

- | | | | |
|-----------|-------|-------|------|
| (a) | (b) | (c) | (d) |
| (1) (iii) | (i) | (iv) | (ii) |
| (2) (v) | (iv) | (iii) | (ii) |
| (3) (iv) | (iii) | (ii) | (i) |
| (4) (iii) | (iv) | (i) | (ii) |
62. Concentration of the Ag^+ ions in a saturated solution of $\text{Ag}_2\text{C}_2\text{O}_4$ is $2.2 \times 10^{-4} \text{ mol L}^{-1}$. Solubility product of $\text{Ag}_2\text{C}_2\text{O}_4$ is :-
 (1) 2.66×10^{-12} (2) 4.5×10^{-11}
 (3) 5.3×10^{-12} (4) 2.42×10^{-8}
63. In the electrochemical cell :-
 $\text{Zn}|\text{ZnSO}_4(0.01\text{M})||\text{CuSO}_4(1.0 \text{ M})|\text{Cu}$, the emf of this Daniel cell is E_1 . When the concentration of ZnSO_4 is changed to 1.0M and that of CuSO_4 changed to 0.01M, the emf changes to E_2 . From the followings, which one is the relationship between E_1 and E_2 ? (Given, $\frac{RT}{F} = 0.059$)
 (1) $E_1 < E_2$ (2) $E_1 > E_2$
 (3) $E_2 = 0 \neq E_1$ (4) $E_1 = E_2$

64. Which of the following pairs of compounds is isoelectronic and isostructural ?
 (1) TeI_2 , XeF_2 (2) IBr_2^- , XeF_2
 (3) IF_3 , XeF_2 (4) BeCl_2 , XeF_2

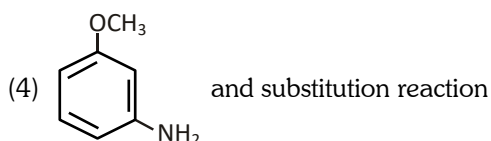
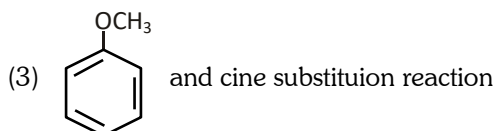
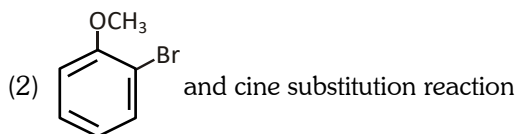
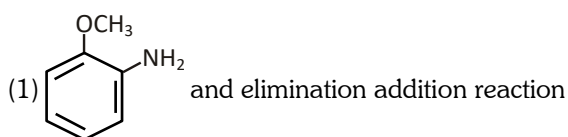
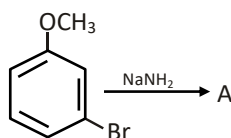
65. The IUPAC name of the compound



- (1) 5-formylhex-2-en-3-one
 (2) 5-methyl-4-oxohex-2-en-5-al
 (3) 3-keto-2-methylhex-5-enal
 (4) 3-keto-2-methylhex-4-enal
66. Which one is the wrong statement ?
 (1) The uncertainty principle is $\Delta E \times \Delta t \geq h/4\pi$
 (2) Half filled and fully filled orbitals have greater stability due to greater exchange energy, greater symmetry and more balanced arrangement.
 (3) The energy of 2s orbital is less than the energy of 2p orbital in case of Hydrogen like atoms
 (4) de-Broglie's wavelength is given by $\lambda = \frac{h}{mv}$, where m = mass of the particle, v = group velocity of the particle
67. Which is the **incorrect** statement ?
 (1) Density decreases in case of crystals with Schottky's defect
 (2) NaCl(s) is insulator, silicon is semiconductor, silver is conductor, quartz is piezo electric crystal
 (3) Frenkel defect is favoured in those ionic compounds in which sizes of cation and anions are almost equal
 (4) $\text{FeO}_{0.98}$ has non stoichiometric metal deficiency defect

68. The species, having bond angles of 120° is:-
 (1) ClF_3 (2) NCl_3 (3) BCl_3 (4) PH_3
69. For a given reaction, $\Delta H = 35.5 \text{ kJ mol}^{-1}$ and $\Delta S = 83.6 \text{ JK}^{-1}\text{mol}^{-1}$. The reaction is spontaneous at :
 (Assume that ΔH and ΔS do not vary with temperature)
 (1) $T > 425 \text{ K}$ (2) All temperatures
 (3) $T > 298 \text{ K}$ (4) $T < 425 \text{ K}$

70. Which of the following is a sink for CO ?
 (1) Micro organism present in the soil
 (2) Oceans
 (3) Plants
 (4) Haemoglobin
71. If molality of the dilute solutions is doubled, the value of molal depression constant (K_f) will be :-
 (1) halved (2) tripled
 (3) unchanged (4) doubled
72. Which of the following is dependent on temperature?
 (1) Molarity (2) Mole fraction
 (3) Weight percentage (4) Molality
73. Which one of the following statements is not correct?
 (1) The value of equilibrium constant is changed in the presence of a catalyst in the reaction at equilibrium
 (2) Enzymes catalyse mainly bio-chemical reactions
 (3) Coenzymes increase the catalytic activity of enzyme
 (4) Catalyst does not initiate any reaction
74. Identify A and predict the type of reaction



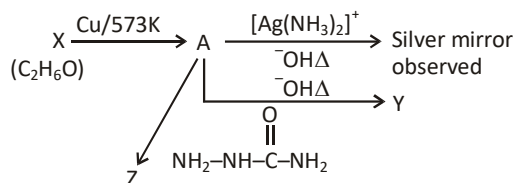
75. The correct order of the stoichiometries of AgCl formed when AgNO_3 in excess is treated with the complexes : $\text{CoCl}_3 \cdot 6\text{NH}_3$, $\text{CoCl}_3 \cdot 5\text{NH}_3$, $\text{CoCl}_3 \cdot 4\text{NH}_3$ respectively is :-
 (1) 3 AgCl, 1 AgCl, 2 AgCl
 (2) 3 AgCl, 2 AgCl, 1 AgCl
 (3) 2 AgCl, 3 AgCl, 1 AgCl
 (4) 1 AgCl, 3 AgCl, 2 AgCl
76. The correct statement regarding electrophile is:-
 (1) Electrophile is a negatively charged species and can form a bond by accepting a pair of electrons from another electrophile
 (2) Electrophiles are generally neutral species and can form a bond by accepting a pair of electrons from a nucleophile
 (3) Electrophile can be either neutral or positively charged species and can form a bond by accepting a pair of electrons from a nucleophile
 (4) Electrophile is a negatively charged species and can form a bond by accepting a pair of electrons from a nucleophile
77. A gas is allowed to expand in a well insulated container against a constant external pressure of 2.5 atm from an initial volume of 2.50 L to a final volume of 4.50 L. The change in internal energy ΔU of the gas in joules will be:-
 (1) -500J (2) -505J
 (3) +505J (4) 1136.25J
78. Which of the following reactions is appropriate for converting acetamide to methanamine?
 (1) Hoffmann hypobromamide reaction
 (2) Stephens reaction
 (3) Gabriels phthalimide synthesis
 (4) Carbylamine reaction
79. With respect to the conformers of ethane, which of the following statements is true ?
 (1) Bond angle changes but bond length remains same
 (2) Both bond angle and bond length change
 (3) Both bond angles and bond length remains same
 (4) Bond angle remains same but bond length changes
80. In which pair of ions both the species contain S-S bond?
 (1) $\text{S}_4\text{O}_6^{2-}$, $\text{S}_2\text{O}_3^{2-}$ (2) $\text{S}_2\text{O}_7^{2-}$, $\text{S}_2\text{O}_8^{2-}$
 (3) $\text{S}_4\text{O}_6^{2-}$, $\text{S}_2\text{O}_7^{2-}$ (4) $\text{S}_2\text{O}_7^{2-}$, $\text{S}_2\text{O}_3^{2-}$

- 81.** It is because of inability of ns^2 electrons of the valence shell to participate in bonding that:-
- (1) Sn^{2+} is oxidising while Pb^{4+} is reducing
 - (2) Sn^{2+} and Pb^{2+} are both oxidising and reducing
 - (3) Sn^{4+} is reducing while Pb^{4+} is oxidising
 - (4) Sn^{2+} is reducing while Pb^{4+} is oxidising

- 82.** Correct increasing order for the wavelengths of absorption in the visible region the complexes of Co^{3+} is :-

- (1) $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$, $[\text{Co}(\text{en})_3]^{3+}$, $[\text{Co}(\text{NH}_3)_6]^{3+}$
- (2) $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$, $[\text{Co}(\text{NH}_3)_6]^{3+}$, $[\text{Co}(\text{en})_3]^{3+}$
- (3) $[\text{Co}(\text{NH}_3)_6]^{3+}$, $[\text{Co}(\text{en})_3]^{3+}$, $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$
- (4) $[\text{Co}(\text{en})_3]^{3+}$, $[\text{Co}(\text{NH}_3)_6]^{3+}$, $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$

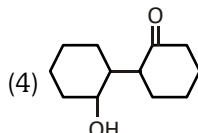
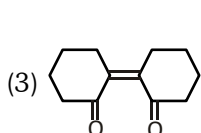
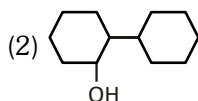
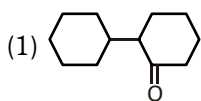
- 83.** Consider the reactions :-



Identify A, X, Y and Z

- (1) A-Methoxymethane, X-Ethanol,
Y-Ethanoic acid, Z-Semicarbazide.
- (2) A-Ethanal, X-Ethanol,
Y-But-2-enal, Z-Semicarbazone
- (3) A-Ethanol, X-Acetaldehyde,
Y-Butanone, Z-Hydrazone
- (4) A-Methoxymethane, X-Ethanoic acid,
Y-Acetate ion, Z-hydrazine

- 84.** Of the following, which is the product formed when cyclohexanone undergoes aldol condensation followed by heating?



- 85.** Which of the following pairs of species have the same bond order?

- (1) O_2 , NO^+ (2) CN^- , CO
(3) N_2 , O_2^- (4) CO , NO

- 86.** Extraction of gold and silver involves leaching with CN^- ion. Silver is later recovered by :-

- (1) distillation
- (2) zone refining
- (3) displacement with Zn
- (4) liquation

- 87.** A 20 litre container at 400 K contains $\text{CO}_2(\text{g})$ at pressure 0.4 atm and an excess of SrO (neglect the volume of solid SrO). The volume of the container is now decreased by moving the movable piston fitted in the container. The maximum volume of the container, when pressure of CO_2 attains its maximum value, will be :-

(Given that : $\text{SrCO}_3(\text{s}) \rightleftharpoons \text{SrO}(\text{s}) + \text{CO}_2(\text{g})$,
 $K_p = 1.6 \text{ atm}$)

- (1) 10 litre (2) 4 litre
(3) 2 litre (4) 5 litre

- 88.** Pick out the correct statement with respect to $[\text{Mn}(\text{CN})_6]^{3-}$:-

- (1) It is sp^3d^2 hybridised and tetrahedral
- (2) It is d^2sp^3 hybridised and octahedral
- (3) It is dsp^2 hybridised and square planar
- (4) It is sp^3d^2 hybridised and octahedral

- 89.** The reason for greater range of oxidation states in actinoids is attributed to :-

- (1) actinoid contraction
- (2) 5f, 6d and 7s levels having comparable energies
- (3) 4f and 5d levels being close in energies
- (4) the radioactive nature of actinoids

- 90.** Which of the following statements is not correct :-

- (1) Ovalbumin is a simple food reserve in egg-white
- (2) Blood proteins thrombin and fibrinogen are involved in blood clotting
- (3) Denaturation makes the proteins more active
- (4) Insulin maintain sugar level in the blood of a human body

- 91.** Which one of the following statements is **correct**, with reference to enzymes ?
- (1) Holoenzyme = Apoenzyme + Coenzyme
 - (2) Coenzyme = Apoenzyme + Holoenzyme
 - (3) Holoenzyme = Coenzyme + Co-factor
 - (4) Apoenzyme = Holoenzyme + Coenzyme
- 92.** A decrease in blood pressure / volume will not cause the release of :
- (1) Atrial natriuretic factor
 - (2) Aldosterone
 - (3) ADH
 - (4) Renin
- 93.** Which cells of "Crypts of Lieberkuhn" secrete antibacterial lysozyme ?
- (1) Paneth cells
 - (2) Zymogen cells
 - (3) Kupffer cells
 - (4) Argentaffin cells
- 94.** Which of the following are not polymeric ?
- (1) Proteins
 - (2) Polysaccharides
 - (3) Lipids
 - (4) Nucleic acids
- 95.** Functional megaspore in an angiosperm develops into ?
- (1) Endosperm
 - (2) Embryo sac
 - (3) Embryo
 - (4) Ovule
- 96.** Myelin sheath is produced by :
- (1) Astrocytes and Schwann cells
 - (2) Oligodendrocytes and Osteoclasts
 - (3) Osteoclasts and Astrocytes
 - (4) Schwann cells and Oligodendrocytes
- 97.** Attractants and rewards are required for :
- (1) Entomophily
 - (2) Hydrophily
 - (3) Cleistogamy
 - (4) Anemophily
- 98.** Receptor sites for neurotransmitters are present on :
- (1) Pre-synaptic membrane
 - (2) Tips of axons
 - (3) Post-synaptic membrane
 - (4) Membrane of synaptic vesicles
- 99.** Coconut fruit is a :
- (1) Berry
 - (2) Nut
 - (3) Capsule
 - (4) Drupe
- 100.** Adult human RBCs are enucleated. Which of the following statement(s) is/are **most appropriate** explanation for this feature ?
- (a) They do not need to reproduce
 - (b) They are somatic cells
 - (c) They do not metabolize
 - (d) All their internal space is available for oxygen transport
- (1) only (a)
 - (2) (a), (c) and (d)
 - (3) (b) and (c)
 - (4) only (d)
- 101.** Capacitation occurs in :
- (1) Epididymis
 - (2) Vas deferens
 - (3) Female reproductive tract
 - (4) Rete testis
- 102.** Which of the following are found in extreme saline conditions ?
- (1) Eubacteria
 - (2) Cyanobacteria
 - (3) Mycobacteria
 - (4) Archaeobacteria
- 103.** Asymptote in a logistic growth curve is obtained when :
- (1) $K = N$
 - (2) $K > N$
 - (3) $K < N$
 - (4) The value of 'r' approaches zero
- 104.** Artificial selection to obtain cows yielding higher milk output represents :
- (1) Directional as it pushes the mean of the character in one direction
 - (2) Disruptive as it splits the population into two, one yielding higher output and the other lower output
 - (3) Stabilizing followed by disruptive as it stabilizes the population to produce higher yielding cows
 - (4) Stabilizing selection as it stabilizes this character in the population

- 105.** Select the mismatch :
- (1) *Rhodospirillum* - Mycorrhiza
 - (2) *Anabaena* - Nitrogen fixer
 - (3) *Rhizobium* - Alfalfa
 - (4) *Frankia* - Alnus
- 106.** Good vision depends on adequate intake of carotene rich food :
Select the best option from the following statements :
- (a) Vitamin A derivatives are formed from carotene
 - (b) The photopigments are embedded in the membrane discs of the inner segment
 - (c) Retinal is a derivative of Vitamin A
 - (d) Retinal is a light absorbing part of all the visual photopigments
- Options :
- (1) (a), (c) and (d) (2) (a) and (c)
 - (3) (b), (c) and (d) (4) (a) and (b)
- 107.** The DNA fragments separated on an agarose gel can be visualised after staining with :
- (1) Acetocarmine (2) Aniline blue
 - (3) Ethidium bromide (4) Bromophenol blue
- 108.** The hepatic portal vein drains blood to liver from:
- (1) Stomach (2) Kidneys
 - (3) Intestine (4) Heart
- 109.** The vascular cambium normally gives rise to:
- (1) Primary phloem (2) Secondary xylem
 - (3) Periderm (4) Phelloderm
- 110.** Thalassemia and sickle cell anemia are caused due to a problem in globin molecule synthesis. Select the correct statement :
- (1) Both are due to a quantitative defect in globin chain synthesis
 - (2) Thalassemia is due to less synthesis of globin molecules
 - (3) Sickel cell anemia is due to a quantitative problem of globin molecules
 - (4) Both are due to a qualitative defect in globin chain synthesis
- 111.** The genotypes of a husband and Wife are $I^A I^B$ & $I^A i$. Among the blood types of their children, how many different genotypes and phenotypes are possible?
- (1) 3 genotypes ; 4 phenotypes
 - (2) 4 genotypes ; 3 phenotypes
 - (3) 4 genotypes ; 4 phenotypes
 - (4) 3 genotypes ; 3 phenotypes
- 112.** Which of the following facilitates opening of stomatal aperture ?
- (1) Decrease in turgidity of guard cells
 - (2) Radial orientation of cellulose microfibrils in the cell wall of guard cells
 - (3) Longitudinal orientation of cellulose microfibrils in the cell wall of guard cells
 - (4) Contraction of outer wall of guard cells
- 113.** In Bougainvillea thorns are the modifications of :
- (1) Adventitious root (2) Stem
 - (3) Leaf (4) Stipules
- 114.** Which one of the following is related to Ex-situ conservation of threatened animals and plants?
- (1) Biodiversity hot spots
 - (2) Amazon rainforest
 - (3) Himalayan region
 - (4) Wildlife safari parks
- 115.** Root hairs develop from the region of :
- (1) Elongation (2) root cap
 - (3) Meristematic activity (4) Maturation
- 116.** A disease caused by an autosomal primary non-disjunction is :
- (1) Klinefelter's Syndrome
 - (2) Turner's Syndrome
 - (3) Sickel Cell Anemia
 - (4) Down's Syndrome
- 117.** The water potential of pure water is :
- (1) Less than zero
 - (2) More than zero but less than one
 - (3) More than one
 - (4) Zero
- 118.** Which of the following options gives the correct sequence of events during mitosis ?
- (1) Condensation → nuclear membrane disassembly → arrangement at equator → centromere division → segregation → telophase
 - (2) Condensation → crossing over → nuclear membrane disassembly → segregation → telophase
 - (3) Condensation → arrangement at equator → centromere division → segregation → telophase
 - (4) Condensation → nuclear membrane disassembly → crossing over → segregation → telophase

- 119.** The process of separation and purification of expressed protein before marketing is called:
 (1) Downstream processing
 (2) Bioprocessing
 (3) Postproduction processing
 (4) Upstream processing
- 120.** A temporary endocrine gland in the human body is :
 (1) Corpus cardiacum (2) corpus luteum
 (3) Corpus allatum (4) Pineal gland
- 121.** Which of the following is made up of dead cells?
 (1) Collenchyma (2) Phellem
 (3) Phloem (4) Xylem parenchyma
- 122.** An example of colonial alga is :
 (1) Volvox (2) Ulothrix
 (3) Spirogyra (4) Chlorella
- 123.** Match the following sexually transmitted diseases (Column-I) with their causative agent (Column-II) and select the correct option :

Column-I		Column-II	
(a)	Gonorrhea	(i)	HIV
(b)	Syphilis	(ii)	<i>Neisseria</i>
(c)	Genital Warts	(iii)	<i>Treponema</i>
(d)	AIDS	(iv)	Human papilloma-Virus

(a)	(b)	(c)	(d)
(1) iii	iv	i	ii
(2) iv	ii	iii	i
(3) iv	iii	ii	i
(4) ii	iii	iv	i

- 124.** The function of copper ions in copper releasing IUD's is :
 (1) They inhibit gametogenesis
 (2) They make uterus unsuitable for implantation
 (3) They inhibit ovulation
 (4) The suppress sperm motility and fertilising capacity of sperms
- 125.** Which of the following in sewage treatment removes suspended solids ?
 (1) Secondary treatment
 (2) Primary treatment
 (3) Sludge treatment
 (4) Tertiary treatment
- 126.** An important characteristic that Hemichordates share with Chordates is :
 (1) Ventral tubular nerve cord
 (2) Pharynx with gill slits
 (3) Pharynx without gill slits
 (4) Absence of notochord

- 127.** The final proof for DNA as the genetic material came from the experiments of :
 (1) Hershey and Chase
 (2) Avery, Mcleod and McCarty
 (3) Hargobind Khorana
 (4) Griffith
- 128.** Among the following characters, which one was not considered by Mendel in his experiments on pea ?
 (1) Trichomes – Glandular or non-glandular
 (2) Seed – Green or Yellow
 (3) Pod – Inflated or Constricted
 (4) Stem - Tall or Dwarf
- 129.** Plants which produce characteristic pneumatophores and show vivipary belong to:
 (1) Halophytes
 (2) Psammophytes
 (3) Hydrophytes
 (4) Mesophytes
- 130.** The pivot joint between atlas and axis is a type of :
 (1) Cartilaginous joint
 (2) Synovial joint
 (3) Saddle joint
 (4) Fibrous joint
- 131.** With reference to factors affecting the rate of photosynthesis, which of the following statements is not correct ?
 (1) Increasing atmospheric CO₂ concentration up to 0.05% can enhance CO₂ fixation rate
 (2) C₃ plants respond to higher temperatures with enhanced photosynthesis while C₄ plants have much lower temperature optimum
 (3) Tomato is a greenhouse crop which can be grown in CO₂ - enriched atmosphere for higher yield
 (4) Light saturation for CO₂ fixation occurs at 10% of full sunlight
- 132.** DNA fragments are:
 (1) Negatively charged
 (2) Neutral
 (3) Either positively or negatively charged depending on their size
 (4) Positively charged

- 133.** Which of the following components provides sticky character to the bacterial cell?
 (1) Nuclear membrane
 (2) Plasma membrane
 (3) Glycocalyx
 (4) Cell wall
- 134.** Which of the following options best represents the enzyme composition of pancreatic juice?
 (1) amylase, pepsin, trypsinogen, maltase
 (2) peptidase, amylase, pepsin, rennin
 (3) lipase, amylase, trypsinogen, procarboxypeptidase
 (4) amylase, peptidase, trypsinogen, rennin
- 135.** Which among these is the correct combination of aquatic mammals ?
 (1) Dolphins, Seals, Trygon
 (2) Whales, Dolphins, Seals
 (3) Trygon, Whales, Seals
 (4) Seals, Dolphins, Sharks
- 136.** Fruit and leaf drop at early stages can be prevented by the application of:
 (1) Ethylene (2) Auxins
 (3) Gibberellic acid (4) Cytokinins
- 137.** Select the correct route for the passage of sperms in male frogs:
 (1) Testes → Vasa efferentia → Kidney → Seminal Vesicle → Urinogenital duct → Cloaca
 (2) Testes → Vasa efferentia → Bidder's canal → Ureter → Cloaca
 (3) Testes → Vasa efferentia → Kidney → Bidder's canal → Urinogenital duct → Cloaca
 (4) Testes → Bidder's canal → Kidney → Vasa efferentia → Urinogenital duct → Cloaca
- 138.** In case of a couple where the male is having a very low sperm count, which technique will be suitable for fertilisation ?
 (1) Gamete intracytoplasmic fallopian transfer
 (2) Artificial Insemination
 (3) Intracytoplasmic sperm injection
 (4) Intrauterine transfer
- 139.** Which ecosystem has the maximum biomass?
 (1) Grassland ecosystem
 (2) Pond ecosystem
 (3) Lake ecosystem
 (4) Forest ecosystem
- 140.** Lungs are made up of air-filled sacs, the alveoli. They do not collapse even after forceful expiration, because of:
 (1) Inspiratory Reserve Volume
 (2) Tidal Volume
 (3) Expiratory Reserve Volume
 (4) Residual Volume
- 141.** Presence of plants arranged into well defined vertical layers depending on their height can be seen best in:
 (1) Tropical Rain Forest (2) Grassland
 (3) Temperate Forest (4) Tropical Savannah
- 142.** Which of the following statements is **correct**?
 (1) The descending limb of loop of Henle is impermeable to water.
 (2) The ascending limb of loop of Henle is permeable to water.
 (3) The descending limb of loop of Henle is permeable to electrolytes.
 (4) The ascending limb of loop of Henle is impermeable to water.
- 143.** Alexander Von Humbolt described for the first time:
 (1) Laws of limiting factor
 (2) Species area relationships
 (3) Population Growth equation
 (4) Ecological Biodiversity
- 144.** Zygotic meiosis is characteristic of;
 (1) Fucus (2) Funaria
 (3) Chlamydomonas (4) Marchantia
- 145.** If there are 999 bases in an RNA that codes for a protein with 333 amino acids, and the base at position 901 is deleted such that the length of the RNA becomes 998 bases, how many codons will be altered?
 (1) 11 (2) 33 (3) 333 (4) 1

- 146.** Flowers which have single ovule in the ovary and are packed into inflorescence are usually pollinated by:
- (1) Bee (2) Wind
(3) Bat (4) Water
- 147.** Transplantation of tissues/organs fails often due to non-acceptance by the patient's body. Which type of immune-response is responsible for such rejections?
- (1) Cell - mediated immune response
(2) Hormonal immune response
(3) Physiological immune response
(4) Autoimmune response
- 148.** Life cycle of Ectocarpus and Fucus respectively are:
- (1) Diplontic, Haplodiplontic
(2) Haplodiplontic, Diplontic
(3) Haplodiplontic, Haplontic
(4) Haplontic, Diplontic
- 149.** A gene whose expression helps to identify transformed cell is known as :
- (1) Vector
(2) Plasmid
(3) Structural gene
(4) Selectable marker
- 150.** A dioecious flowering plant prevents both :
- (1) Autogamy and geitonogamy
(2) Geitonogamy and xenogamy
(3) Cleistogamy and xenogamy
(4) Autogamy and xenogamy
- 151.** Which statement is wrong for Krebs' cycle ?
- (1) There is one point in the cycle where FAD^+ is reduced to FADH_2
(2) During conversion of succinyl CoA to succinic acid, a molecule of GTP is synthesised
(3) The cycle starts with condensation of acetyl group (acetyl CoA) with pyruvic acid to yield citric acid
(4) There are three points in the cycle where NAD^+ is reduced to $\text{NADH} + \text{H}^+$
- 152.** Phosphoenol pyruvate (PEP) is the primary CO_2 acceptor in:
- (1) C_4 plants
(2) C_2 plants
(3) C_3 and C_4 plants
(4) C_3 plants
- 153.** During DNA replication, Okazaki fragments are used to elongate:
- (1) The lagging strand towards replication fork.
(2) The leading strand away from replication fork.
(3) The lagging strand away from the replication fork.
(4) The leading strand towards replication fork.
- 154.** Which of the following RNAs should be most abundant in animal cell ?
- (1) t-RNA
(2) m-RNA
(3) mi-RNA
(4) r-RNA
- 155.** GnRH, a hypothalamic hormone, needed in reproduction, acts on:
- (1) anterior pituitary gland and stimulates secretion of LH and FSH.
(2) posterior pituitary gland and stimulates secretion of oxytocin and FSH.
(3) posterior pituitary gland and stimulates secretion of LH and relaxin.
(4) anterior pituitary gland and stimulates secretion of LH and oxytocin.
- 156.** What is the criterion for DNA fragments movement on agarose gel during gel electrophoresis ?
- (1) The smaller the fragment size, the farther it moves
(2) Positively charged fragments move to farther end
(3) Negatively charged fragments do not move
(4) The larger the fragment size, the farther it moves

- 157.** Hypersecretion of Growth Hormone in adults does not cause further increase in height, because:

 - (1) Epiphyseal plates close after adolescence.
 - (2) Bones lose their sensitivity to Growth Hormone in adults.
 - (3) Muscle fibres do not grow in size after birth.
 - (4) Growth Hormone becomes inactive in adults.

158. DNA replication in bacteria occurs:

 - (1) Within nucleolus
 - (2) Prior to fission
 - (3) Just before transcription
 - (4) During S phase

159. Which one from those given below is the period for Mendel's hybridization experiments?

 - (1) 1840 - 1850
 - (2) 1857 - 1869
 - (3) 1870 - 1877
 - (4) 1856 - 1863

160. Viroids differ from viruses in having;

 - (1) DNA molecules without protein coat
 - (2) RNA molecules with protein coat
 - (3) RNA molecules without protein coat
 - (4) DNA molecules with protein coat

161. MALT constitutes about _____ percent of the lymphoid tissue in human body.

(1) 20%	(2) 70%
(3) 10%	(4) 50%

162. Which of the following is correctly matched for the product produced by them ?

 - (1) *Methanobacterium* : Lactic acid
 - (2) *Penicillium notatum* : Acetic acid
 - (3) *Sacchromyces cerevisiae* : Ethanol
 - (4) *Acetobacter aceti* : Antibiotics

163. Which among the following are the smallest living cells, known without a definite cell wall, pathogenic to plants as well as animals and can survive without oxygen ?

 - (1) *Pseudomonas*
 - (2) *Mycoplasma*
 - (3) *Nostoc*
 - (4) *Bacillus*

164. Which of the following represents order of 'Horse' ?

(1) Perissodactyla	(2) Caballus
(3) Ferus	(4) Equidae

165. Frog's heart when taken out of the body continues to beat for sometime.
Select the best option from the following statements.

 - (a) Frog is a poikilotherm.
 - (b) Frog does not have any coronary circulation.
 - (c) Heart is "myogenic" in nature.
 - (d) Heart is autoexcitable

Options:

(1) Only(d)	(2) (a) and (b)
(3) (c)and(d)	(4) Only(c)

166. Homozygous purelines in cattle can be obtained by:

 - (1) mating of unrelated individuals of same breed.
 - (2) mating of individuals of different breed.
 - (3) mating of individuals of different species.
 - (4) mating of related individuals of same breed.

167. Identify the wrong statement in context of heartwood:

 - (1) It is highly durable
 - (2) It conducts water and minerals efficiently
 - (3) It comprises dead elements with highly lignified walls
 - (4) Organic compounds are deposited in it

168. Anaphase Promoting Complex (APC) is a protein degradation machinery necessary for proper mitosis of animal cells. If APC is defective in a human cell, which of the following is expected to occur ?

 - (1) Chromosomes will be fragmented
 - (2) Chromosomes will not segregate
 - (3) Recombination of chromosome arms will occur
 - (4) Chromosomes will not condense

169. Which of the following cell organelles is responsible for extracting energy from carbohydrates to form ATP ?

 - (1) Ribosome
 - (2) Chloroplast
 - (3) Mitochondrion
 - (4) Lysosome

- 170.** Mycorrhizae are the example of:
 (1) Amensalism (2) Antibiosis
 (3) Mutualism (4) Fungistasis
- 171.** Out of 'X' pairs of ribs in humans only 'Y' pairs are true ribs. Select the option that correctly represents values of X and Y and provides their explanation:
 (1) X = 12, Y = 5 True ribs are attached dorsally to vertebral column and sternum on the two ends.
 (2) X = 24, Y = 7 True ribs are dorsally attached to vertebral column but are free on ventral side.
 (3) X = 24, Y = 12 True ribs are dorsally attached to vertebral column but are free on ventral side.
 (4) X = 12, Y = 7 True ribs are attached dorsally to vertebral column and ventrally to the sternum.
- 172.** In case of poriferans, the spongocoel is lined with flagellated cells called:
 (1) oscula
 (2) choanocytes
 (3) mesenchymal cells
 (4) ostia
- 173.** Which one of the following statements is not valid for aerosols ?
 (1) They alter rainfall and monsoon patterns
 (2) They cause increased agricultural productivity
 (3) They have negative impact on agricultural land
 (4) They are harmful to human health
- 174.** A baby boy aged two years is admitted to play school and passes through a dental check - up. The dentist observed that the boy had twenty teeth. Which teeth were absent?
 (1) Canines (2) Pre-molars
 (3) Molars (4) Incisors
- 175.** Select the mismatch
 (1) *Cycas* – Dioecious
 (2) *Salvinia* – Heterosporous
 (3) *Equisetum* – Homosporous
 (4) *Pinus* – Dioecious
- 176.** The morphological nature of the edible part of coconut is:
 (1) Cotyledon
 (2) Endosperm
 (3) Pericarp
 (4) Perisperm
- 177.** Double fertilization is exhibited by :
 (1) Algae
 (2) Fungi
 (3) Angiosperms
 (4) Gymnosperms
- 178.** Spliceosomes are not found in cells of;
 (1) Fungi
 (2) Animals
 (3) Bacteria
 (4) Plants
- 179.** The association of histone H1 with a nucleosome indicates:
 (1) DNA replication is occurring.
 (2) The DNA is condensed into a Chromatin Fibre.
 (3) The DNA double helix is exposed.
 (4) Transcription is occurring.
- 180.** The region of Biosphere Reserve which is legally protected and where no human activity is allowed is known as:
 (1) Buffer zone
 (2) Transition zone
 (3) Restoration zone
 (4) Core zone

ANSWER KEY

NEET(UG)-2017

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	2	2	1	3	4	4	1	2	1	2	2	2	1	4	2
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	2	3	4	4	3	1	1	3	2	3	B	B	1	4	2
Que.	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Ans.	4	2	2	3	1	2	1	B	4	2	1	3	3	3	4
Que.	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ans.	1	3	1	2	1	3	1	3	3	3	3	2	1	1	1
Que.	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Ans.	1	3	2	2	4	3	3,4	3	1	1	3	1	1	4	2
Que.	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
Ans.	3	2	1	3	1	4	4	2	1	2	3	4	2	2	3
Que.	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105
Ans.	1	1	1	3	2	4	1	3	4	4	3	4	1	1	1
Que.	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
Ans.	1	3	3	2	2	2	2	2	4	4	4	4	1	1	2
Que.	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135
Ans.	2	1	4	4	2	2	1	1	1	2	2	1	3	3	2
Que.	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
Ans.	2	3	2	4	4	1	4	2	3	2	2	1	2	4	1
Que.	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165
Ans.	3	1	3	4	1	1	1	2	4	3	4	3	2	1	3
Que.	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
Ans.	4	2	2	3	3	4	2	2	2	4	2	3	3	2	4

HINT - SHEET

1. Length of the spring segments = $\frac{\ell}{6}, \frac{\ell}{3}, \frac{\ell}{2}$
 As we know $K \propto \frac{1}{\ell}$
 so spring constants for spring segments will be
 $K_1 = 6K, K_2 = 3K, K_3 = 2K$
 so in parallel combination
 $K'' = K_1 + K_2 + K_3 = 11K$
 in series combination
 $K' = K$ (As it will become original spring)
 so $K' : K'' = 1 : 11$

2. Resolving power $\propto \frac{1}{\lambda}$
 $\frac{RP_1}{RP_2} = \frac{\lambda_2}{\lambda_1} = \frac{6000\text{\AA}}{4000\text{\AA}} = \frac{3}{2}$

3. Difference between any two consecutive frequencies of COP = $\frac{2v}{4\ell} = 260 - 220 = 40\text{ Hz}$
 $\Rightarrow \frac{v}{4\ell} = 20\text{ Hz}$
 So fundamental frequency = 20 Hz
4. Work done by the gravity (W_g) = mgh
 $= 10^{-3} \times 10 \times 10^3 = 10\text{ J}$
 By work-energy theorem = $W_g + W_{\text{res}} = \Delta KE$

$$10 + W_{\text{res}} = \frac{1}{2} \times 10^{-3} \times (50)^2$$

$$W_{\text{res}} = -8.75\text{ J}$$

$$5. [L] = [c]^a [G]^b \left[\frac{e^2}{4\pi\epsilon_0} \right]^c$$

$$[L] = [LT^{-1}]^a [M^{-1}L^3T^{-2}]^b [ML^3T^{-2}]^c$$

$$[L] = L^{a+3b+3c} M^{-b+c} T^{-a-2b-2c}$$

$$a + 3b + 3c = 1$$

$$-b + c = 0$$

$$a + 2b + 2c = 0$$

On solving,

$$a = -2, b = \frac{1}{2}, c = \frac{1}{2}$$

$$\therefore L = \frac{1}{c^2} \left[G \cdot \frac{e^2}{4\pi\epsilon_0} \right]^{\frac{1}{2}}$$

$$6. \text{ In parallel } \frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$\frac{K_{eq}(2A)}{\ell} = \frac{K_1 A}{\ell} + \frac{K_2 A}{\ell}$$

$$K_{eq} = \frac{K_1 + K_2}{2}$$

$$7. U_i = \frac{1}{2} CV^2$$

$$U_f = \frac{1}{2} [2C] \left[\frac{V}{2} \right]^2 = \frac{1}{2} U_i$$

Decrease by a factor of 2

$$8. A_V = \beta \frac{R_C}{R_B} = 100 \times \frac{3k\Omega}{2k\Omega} = 150$$

$$\text{Power gain} = \beta A_V = 100 \times 150 = 15000$$

9. Process (1) \rightarrow volume constant \rightarrow Isochoic

Process (2) \rightarrow adiabatic

Process (3) \rightarrow Temperature constant \rightarrow Isothermal

Process (4) \rightarrow Pressure constant \rightarrow Isobaric

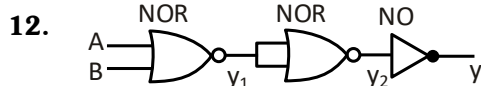
$$10. \frac{K \times (\Delta e)^2}{r^2} = \frac{Gm^2}{r^2}$$

$$\Delta e = m \sqrt{\frac{G}{K}} = 1.67 \times 10^{-27} \sqrt{\frac{6.67 \times 10^{-11}}{9 \times 10^9}} \text{ C}$$

$$= 1.436 \times 10^{-37} \text{ C}$$

$$11. R = \frac{\rho \ell}{A} = \frac{\rho \ell^2}{\text{volume}} \Rightarrow R \propto \ell^2$$

$$\Rightarrow R_2 = n^2 R_1$$



$$Y_1 = \overline{A + B}$$

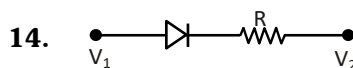
$$Y_2 = \overline{Y_1 + Y_1} = \overline{Y_1} = \overline{\overline{A + B}} = A + B$$

$$Y = \overline{Y_2} = \overline{A + B}$$

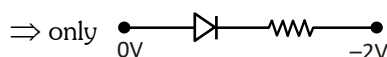
NOR GATE

13. Kinetic energy of thermal neutron with equilibrium is $\frac{3}{2} KT$

$$\lambda = \frac{h}{mv} = \frac{h}{\sqrt{2m K.E}} = \frac{h}{\sqrt{2m \left(\frac{3}{2} KT \right)}} = \frac{h}{\sqrt{3 mKT}}$$



In forward bias $V_1 > V_2$



is in forward bias

$$15. q = \left[\left(\frac{\Delta \phi}{\Delta t} \right) \cdot \frac{1}{R} \right] \Delta t$$

$$q = \left[\mu_0 n N \pi r^2 \frac{\Delta i}{\Delta t} \right] \frac{1}{R} \Delta t$$

$$q = \left[4\pi \times 10^{-7} \times 2 \times 10^4 \times 100 \times \pi \times (10^{-2})^2 \times \left(\frac{4}{0.05} \right) \right]$$

$$\frac{1}{10\pi^2} \times 0.05$$

$$q = 32 \mu C$$

16. $V_1 \rightarrow$ velocity of Preeti

$V_2 \rightarrow$ velocity of escalator

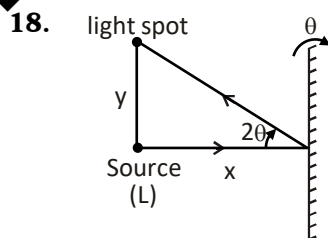
$\ell \rightarrow$ distance

$$t = \frac{\ell}{V_1 + V_2} = \frac{\ell}{\frac{\ell}{t_1} + \frac{\ell}{t_2}} = \frac{t_1 t_2}{t_1 + t_2}$$

17. $(y_8)_{\text{Bright, medium}} = (y_5)_{\text{Dark, air}}$

$$\frac{8\lambda_m D}{d} = \left(\frac{2(5) - 1}{2} \right) \frac{\lambda D}{d}$$

$$\frac{8\lambda_m D}{\mu d} = \frac{9 \lambda D}{2 d} \Rightarrow \mu = \frac{16}{9} = 1.78$$



$$2\theta = \frac{y}{x}; \quad \theta = \frac{y}{2x}$$

19. $\tan\theta_1 = \frac{\tan\theta}{\cos\alpha}$

$$\& \tan\theta_2 = \frac{\tan\theta}{\cos(90-\alpha)} = \frac{\tan\theta}{\sin\alpha}$$

$$\text{As } \sin^2\alpha + \cos^2\alpha = 1$$

$$\text{So } \cot^2\theta_2 + \cot^2\theta_1 = \cot^2\theta$$

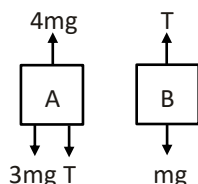
20. $v_s = 22 \text{ m/s}$ $v_0 = 16.5 \text{ m/s}$
 $f_0 = 400 \text{ Hz}$

As we know for given condition

$$f_{\text{app}} = f_0 \left(\frac{v + v_{\text{observer}}}{v - v_{\text{source}}} \right) = 400 \left(\frac{340 + 16.5}{340 - 22} \right)$$

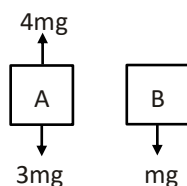
$$f_{\text{app}} = 448 \text{ Hz}$$

21. Before cutting the strip :-



$$\therefore T = mg$$

After cutting the strip :-



$$a_A = \frac{4mg - 3mg}{3m} = \frac{g}{3}$$

$$a_B = \frac{mg}{m} = g$$

22. For dispersion without deviation

$$\delta_1 = \delta_2$$

$$A_1(\mu_1 - 1) = A_2(\mu_2 - 1)$$

$$10(1.42 - 1) = A_2(1.7 - 1)$$

$$A_2 = 6^\circ$$

23. $\therefore g_h = g_d$

$$g \left(1 - \frac{2h}{R} \right) = g \left(1 - \frac{d}{R} \right)$$

$$d = 2h = 2 \text{ km}$$

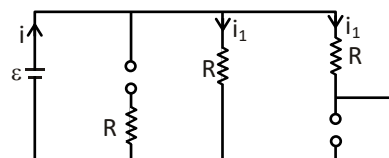
24. In zero deflection condition, potentiometer draws no current.

25. $P \propto r^2 T^4$

$$\Rightarrow \frac{P_1}{P_2} = \left(\frac{r_1}{r_2} \right)^2 \left(\frac{T_1}{T_2} \right)^4 \Rightarrow \frac{450}{P_2} = \left(\frac{r}{r/2} \right)^2 \left(\frac{T}{2T} \right)^4$$

$$\Rightarrow P_2 = 1800 \text{ watt}$$

26. at $t = 0$



$$i_1 = \frac{\varepsilon}{R} = \frac{18}{9} = 2A$$

\therefore Current through the battery is

$$i = 2i_1 = 2 \times 2 = 4A \text{ (Bonus)}$$

OR

According to question language :

Capacitor is not mentioned so $i = 2A$

27. $\lambda_A = 8\lambda, \lambda_B = \lambda$

$$\Rightarrow N_B = \frac{N_A}{e} \Rightarrow N_0 e^{-\lambda t} = \frac{N_0 e^{-8\lambda t}}{e}$$

$$\Rightarrow -\lambda t = -8\lambda t - 1 \Rightarrow 7\lambda t = -1 \Rightarrow t = -\frac{1}{7\lambda}$$

$$\text{Best answer is } t = \frac{1}{7\lambda}$$

28. $W = q\Delta V$

as ΔV is same in all conditions, work will be same.

29. $v_x = 5 - 4t, v_y = 10$

$$a_x = -4, a_y = 0$$

$$\vec{a} = a_x \hat{i} + a_y \hat{j}$$

$$\vec{a} = -4\hat{i} \text{ m/s}^2$$

31. Net force on the particle in uniform circular motion is centripetal force, which is provided by the tension in string.

32. Amplitude $A = 3 \text{ cm}$

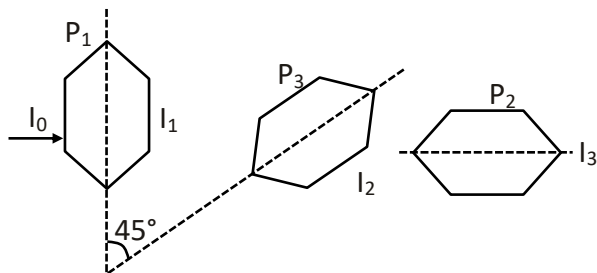
When particle is at $x = 2 \text{ cm}$,

its $|\text{velocity}| = |\text{acceleration}|$

$$\text{i.e., } \omega \sqrt{A^2 - x^2} = \omega^2 x \Rightarrow \omega = \frac{\sqrt{A^2 - x^2}}{x}$$

$$T = \frac{2\pi}{\omega} = 2\pi \left(\frac{x}{\sqrt{A^2 - x^2}} \right) = \frac{4\pi}{\sqrt{5}}$$

33.



$$I_1 = \frac{I_0}{2}$$

$$I_2 = \frac{I_0}{2} \cos^2 45^\circ = \frac{I_0}{4}$$

$$I_3 = \frac{I_0}{4} \cos^2 45^\circ = \frac{I_0}{8}$$

$$34. \quad B = \frac{\Delta P}{-\frac{\Delta V}{V}}, \quad \frac{\Delta V}{V} = \frac{3\Delta R}{R}$$

$$B = \frac{\Delta P}{-\frac{3\Delta R}{R}} \Rightarrow -\frac{\Delta R}{R} = \frac{P}{3B} \quad (\Delta P = P)$$

$$35. \quad E_0 = CB_0$$

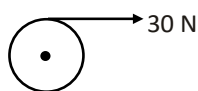
$$E_{\text{rms}} = \frac{E_0}{\sqrt{2}}$$

$$\Rightarrow E_{\text{rms}} \sqrt{2} = CB_0$$

$$\Rightarrow B_0 = \frac{E_{\text{rms}} \sqrt{2}}{C} = \frac{6 \times \sqrt{2}}{3 \times 10^8} = 2.83 \times 10^{-8} \text{ T}$$

$$36. \quad \tau = I\alpha$$

$$RF = mR^2\alpha$$



$$\alpha = \frac{F}{mR} = \frac{30}{3 \times \frac{40}{100}} = 25 \text{ rad/s}^2$$

$$37. \quad \text{COAM : } I\omega_1 + I\omega_2 = 2I\omega \Rightarrow \omega = \frac{\omega_1 + \omega_2}{2}$$

$$(\text{K.E.})_i = \frac{1}{2} I\omega_1^2 + \frac{1}{2} I\omega_2^2$$

$$(\text{K.E.})_f = \frac{1}{2} \times 2I\omega^2 = I \left(\frac{\omega_1 + \omega_2}{2} \right)^2$$

$$\text{Loss in K.E.} = (\text{K.E.})_i - (\text{K.E.})_f = \frac{I}{4} (\omega_1 - \omega_2)^2$$

$$38. \quad \lambda_0 = 3250 \text{ \AA}$$

$$\lambda = 2536 \text{ \AA}$$

$$\frac{1}{2}mv^2 = hc \left[\frac{1}{\lambda} - \frac{1}{\lambda_0} \right]$$

$$v = \sqrt{\frac{2hc}{m} \left[\frac{1}{\lambda} - \frac{1}{\lambda_0} \right]}$$

$$= \sqrt{\frac{2 \times 12400 \times 1.6 \times 10^{-19}}{9.1 \times 10^{-31}} \left[\frac{714}{2536 \times 3250} \right]}$$

$$= 0.6 \times 10^6 \text{ m/s} = 6 \times 10^5 \text{ m/s}$$

$$39. \quad \text{Work} = MB[\cos \theta_1 - \cos \theta_2]$$

$$\text{Work} = MB[\cos 0 - \cos 180^\circ]$$

$$W = NiAB[1 - (-1)]$$

$$W \approx 9.1 \text{ \mu J}$$

$$40. \quad \text{For last line of Balmer : } n_1 = 2 \text{ \& } n_2 = \infty$$

$$\frac{1}{\lambda_B} = RZ^2 \left[\frac{1}{n_1^2} - \frac{1}{n_2^2} \right] = R(1)^2 \left[\frac{1}{2^2} - \frac{1}{\infty^2} \right]$$

$$\lambda_B = \frac{4}{R} \dots (1)$$

$$\text{For last line of Lyman series : } n_1 = 1 \text{ \& } n_2 = \infty$$

$$\frac{1}{\lambda_L} = RZ^2 \left[\frac{1}{n_1^2} - \frac{1}{n_2^2} \right] = R(1)^2 \left[\frac{1}{1^2} - \frac{1}{\infty^2} \right]$$

$$\lambda_L = 1/R \dots (2)$$

$$\frac{\lambda_B}{\lambda_L} = \frac{(4/R)}{(1/R)} = 4$$

$$41. \quad \beta = \frac{Q_2}{W} = \frac{1 - \eta}{\eta}$$

$$\Rightarrow \frac{Q_2}{10} = \frac{1 - 0.1}{0.1} = 9$$

$$\Rightarrow Q_2 = 9 \times 10 = 90 \text{ J}$$

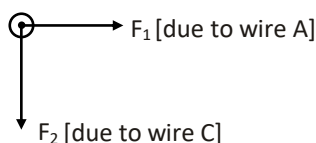
$$42. \quad U = \frac{f}{2} nRT$$

$$U_{\text{total}} = \frac{5}{2} (2) RT + \frac{3}{2} (4) RT$$

$$U_{\text{total}} = 11RT$$

43. $F = \frac{\mu_0 i_1 i_2}{2\pi d}$ = force per unit length

$$F_1 = \frac{(\mu_0 i) i}{2\pi d} = \frac{\mu_0 i^2}{2\pi d} = F_2$$



$$F_{\text{net}} = \sqrt{F_1^2 + F_2^2} = \frac{\mu_0 i^2}{\sqrt{2}\pi d}$$

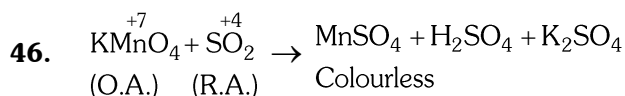
44. $\rho_{\text{og}} \times 140 \times 10^{-3} = \rho_{\text{wg}} \times 130 \times 10^{-3}$

$$\rho_0 = \frac{130}{140} \times 10^3 \approx 928 \text{ kg/m}^3$$

45. Centre of mass may lie on centre of gravity net torque of gravitational pull is zero about centre of mass.

$$\text{Mechanical advantage} = \frac{\text{Load}}{\text{Effort}} > 1$$

$\Rightarrow \text{Load} > \text{Effort}$



47. According to law of mass action
 $r = K[X][Y_2] \dots (1)$

From fast step-1

$$K_{\text{eq}} = \frac{[X]^2}{[X_2]}$$

$$[X]^2 = K_{\text{eq}} [X_2]$$

$$[X] = \sqrt{K_{\text{eq}}} [X_2]^{1/2} \dots (2)$$

From equation (1) & (2)

$$r = K \sqrt{K_{\text{eq}}} [X_2]^{1/2} [Y_2]$$

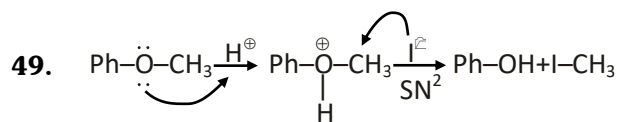
$$r = K' [X_2]^{1/2} [Y_2]$$

Overall order of reaction = 1 + 0.5 = 1.5

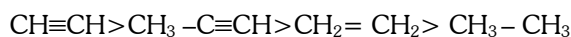
Option (3)

48. $Z = 114 [\text{Rn}]^{86} 7s^2 5f^{14} 6d^{10} 7p^2$

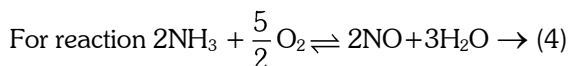
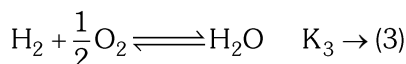
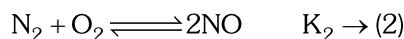
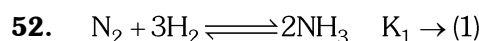
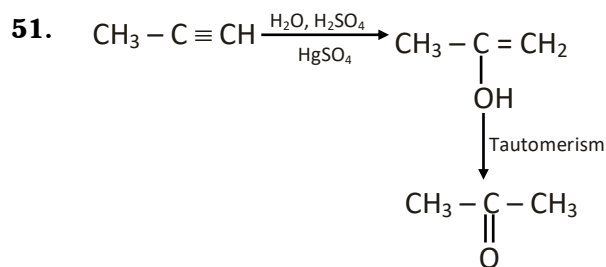
14th gp. (carbon family)



50. Correct order of acidic strength \Rightarrow

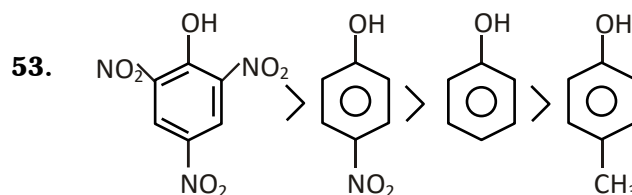


acc. to EN and Inductive effect.



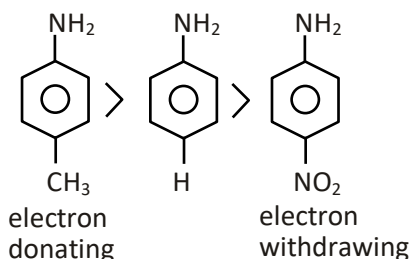
$$\text{eq}^n. (4) = \text{eq}^n. (2) + 3 \times \text{eq}^n. (3) - \text{eq}^n. (1)$$

$$\Rightarrow K = \frac{K_2 \cdot K_3^3}{K_1}, \text{Option (1)}$$



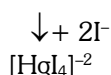
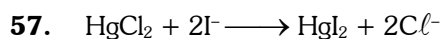
More -I, -M, more acidic

54. Order of Basic Strength :-

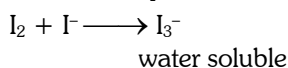


55. Ionic mobility $\propto \frac{1}{\text{size of hydrated ion}}$
- Smaller size hydrated ion in aq. solⁿ - Rb⁺(aq)
- Larger size hydrated ion in aq. solⁿ - Li⁺(aq)
- Lowest ionic mobility in aq. solⁿ \rightarrow Li⁺(aq) due to high hydration

56. The ortho and para isomers can be separated by steam distillation o-Nitrophenol is steam volatile due to intramolecular hydrogen bonding while p-nitro phenol is less volatile due to intermolecular hydrogen bonding which cause association of molecule.



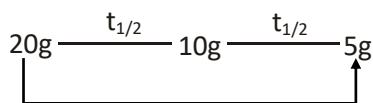
Soluble complex



58. Antiseptic (dettol)

60. Half life of first order reaction $t_{1/2} = \frac{0.693}{K}$
- $$= \frac{0.693}{10^{-2}} = 69.3 \text{ sec}$$

Method-1



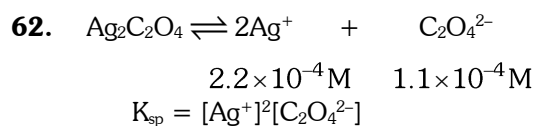
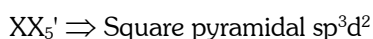
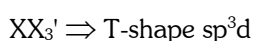
$$\text{Total time} = 2t_{1/2} = 2 \times 69.3 = 138.6 \text{ sec}$$

Method-2

$$t = \frac{2.303}{K} \log \frac{[A]_0}{[A]_t}$$

$$t = \frac{2.303}{10^{-2}} \log \frac{20}{5} \Rightarrow t = 138.6 \text{ sec (Option 1)}$$

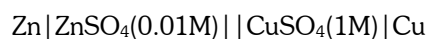
61. $\text{XX}' \Rightarrow$ Linear



$$= [2.2 \times 10^{-4}]^2 \cdot [1.1 \times 10^{-4}]$$

$$K_{sp} = 5.3 \times 10^{-12}$$

63. For cell



$$E_1 = E^\circ - \frac{0.059}{2} \log \frac{\text{Zn}^{+2}}{\text{Cu}^{+2}}$$

$$E_1 = E^\circ - \frac{0.059}{2} \log \frac{0.01}{1}$$

$$= E^\circ - \frac{0.059}{2} \log \frac{1}{100} \quad \dots(1)$$

For cell



$$E_2 = E^\circ - \frac{0.059}{2} \log \frac{1}{0.01}$$

$$= E^\circ - \frac{0.059}{2} \log 100 \quad \dots(2) \quad \boxed{E_1 > E_2}$$

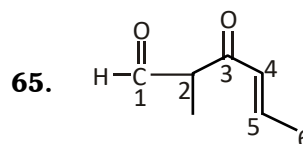
Option (2)

64. IBr_2^{-1} & XeF_2 are iso-structural



(Linear shape)

and Both C.A. consist of same no. of valence e⁻s



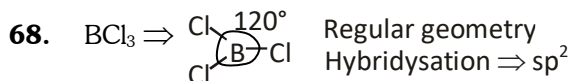
3-keto-2-methylhex-4-en-1-al

66. In H-like atom energy of 2s = 2p. orbital

Incorrect statement is (3)

67. In frenkel defect the radius of cation must be very less than anion.

Incorrect statement is (3)



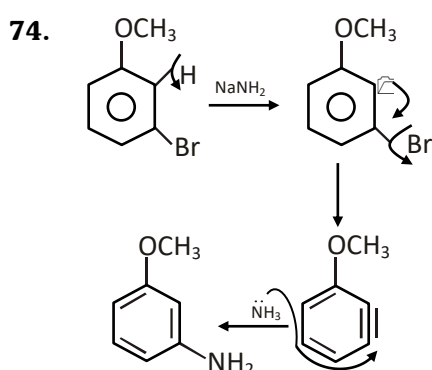
69. $\Delta G = \Delta H - T\Delta S$
for equilibrium $\Delta G = 0$

$$\Delta H = T\Delta S$$

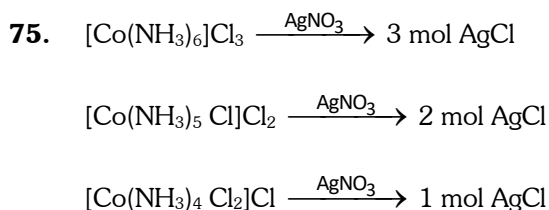
$$T_{\text{eq.}} = \frac{\Delta H}{\Delta S} = \frac{35.5 \times 1000}{83.6} = 425\text{K}$$

Since the reaction is endothermic it will be spontaneous at $T > 425\text{K}$. Option (1)

70. Microorganism present in the soil.
71. K_f does not depend on concentration of solution. It only depends on nature of solvent so it will be unchanged. option (3)
72. Temperature dependent unit is molarity.
73. Equilibrium constant is not affected by presence of catalyst hence statement (1) is incorrect.



Example of substitution reaction.



76. Electrophile can be either neutral or positively charged species and can form a bond by accepting a pair of electron from a nucleophile.

77. Work done in irreversible process

$$W = -P_{\text{ext}}\Delta V$$

$$= -2.5 [4.5 - 2.5] = -5 \text{ L atm}$$

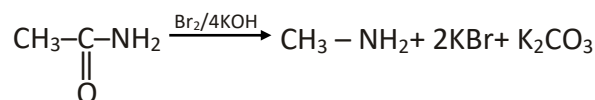
$$= -5 \times 101.3\text{J} \approx -505\text{J}$$

Since system is well insulated $q = 0$

By FLOT $\Delta E = q + W$

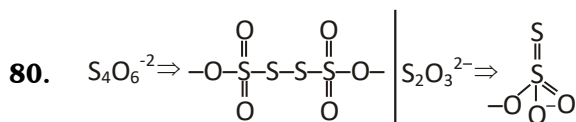
$$\Delta E = W = -505 \text{ J} \quad \text{Option(2)}$$

- 78.



This reaction is known as hoffmann hypobromamide reaction.

79. In conformation bond angle and bond length remain same.



81. $\text{Sn}^{+2} \longrightarrow \text{Sn}^{+4}$
(R.A) $\text{Sn}^{+2} < \text{Sn}^{+4}$ Stability order
 $\text{Pb}^{+4} \longrightarrow \text{Pb}^{+2}$
(O.A) $\text{Pb}^{+2} > \text{Pb}^{+4}$ Stability order
(Inert pair effect)

82. $\left[E_a \propto \frac{1}{\lambda_a} \right]$

where $E_a \Rightarrow$ absorbed energy (splitting energy)

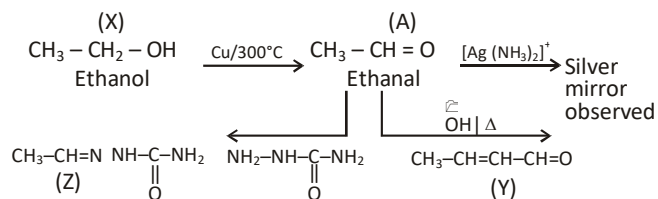
$$\lambda_a \Rightarrow \text{absorbed wavelength}$$

Presence of SFL $\Rightarrow E_a(\uparrow) \lambda_a(\downarrow)$

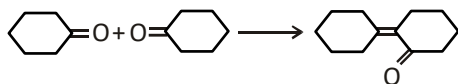
$$\text{H}_2\text{O} < \text{NH}_3 < \text{en ligand strength} \uparrow \text{ splitting}$$

$$\text{energy} \uparrow \text{ so absorbed } \lambda \downarrow$$

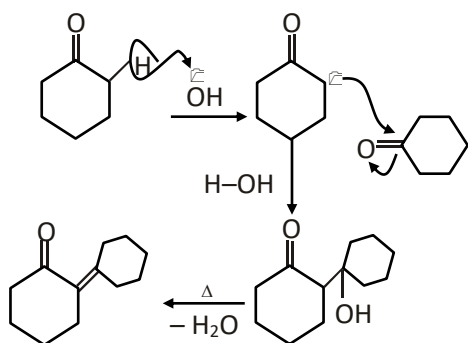
83.



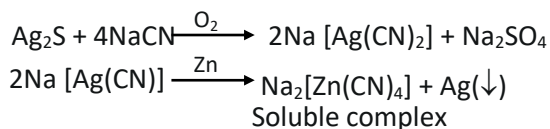
84.



Mechanism

85. Total no. of electrons in CN^- is 14Total no. of electrons in CO is also 14hence B.O. of both CN^- & CO is 3

86. Mac arthur forest process/cyanide process



Ag extracts by displacement with Zn

87. $\text{SrCO}_3(\text{s}) \rightleftharpoons \text{SrO}(\text{s}) + \text{CO}_2(\text{g})$

$$K_p = P_{\text{CO}_2}$$

maximum pressure of $\text{CO}_2 = 1.6 \text{ atm}$

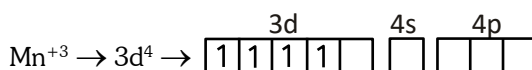
$$P_1 V_1 = P_2 V_2$$

$$0.4 \times 20 = 1.6 V_2$$

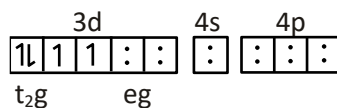
$$V_2 = 5 \text{ L} \quad \text{option (4)}$$

88. $[\text{Mn}(\text{CN})_6]^{3-} \rightarrow \text{O.S. of Mn is (+3)}$

$$\boxed{\text{C.N.} = 6}$$



Presence of SFL (Pairing is possible)

 $[d^2sp^3, \text{octahedral}]$

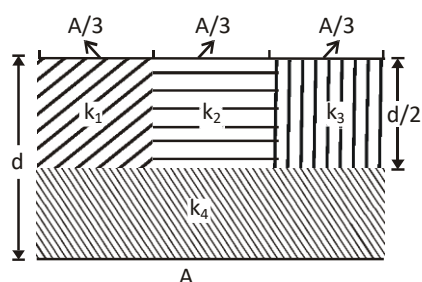
89. Minimum energy gap between

5f, 6d & 7s subshell. That's why e^- excitation will be easier.

90. Denaturation makes the protein less active.

NEET-(II) – 2016

1. A parallel-plate capacitor of area A , plate separation d and capacitance C is filled with four dielectric materials having dielectric constants k_1 , k_2 , k_3 and k_4 as shown in the figure below. If a single dielectric material is to be used to have the same capacitance C in this capacitor, then its dielectric constant k is given by :-



- (1) $\frac{2}{k} = \frac{3}{k_1 + k_2 + k_3} + \frac{1}{k_4}$
 (2) $\frac{1}{k} = \frac{1}{k_1} + \frac{1}{k_2} + \frac{1}{k_3} + \frac{3}{2k_4}$
 (3) $k = k_1 + k_2 + k_3 + 3k_4$
 (4) $k = \frac{2}{3}(k_1 + k_2 + k_3) + 2k_4$
2. The potential difference ($V_A - V_B$) between the points A and B in the given figure is :-
-
- (1) + 6 V (2) + 9 V (3) - 3 V (4) + 3 V
3. A filament bulb (500 W, 100 V) is to be used in a 230 V main supply. When a resistance R is connected in series, it works perfectly and the bulb consumes 500 W. The value of R is :-
- (1) 26 Ω (2) 13 Ω (3) 230 Ω (4) 46 Ω
4. A long wire carrying a steady current is bent into a circular loop of one turn. The magnetic field at the centre of the loop is B . It is then bent into a circular coil of n turns. The magnetic field at the centre of this coil of n turns will be :-
- (1) $2nB$ (2) $2n^2B$ (3) nB (4) n^2B

5. A bar magnet is hung by a thin cotton thread in a uniform horizontal magnetic field and is in equilibrium state. The energy required to rotate it by 60° is W . Now the torque required to keep the magnet in this new position is :-

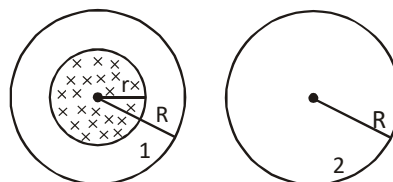
- (1) $\frac{\sqrt{3}W}{2}$ (2) $\frac{2W}{\sqrt{3}}$
 (3) $\frac{W}{\sqrt{3}}$ (4) $\sqrt{3}W$

6. An electron is moving in a circular path under the influence of a transverse magnetic field of 3.57×10^{-2} T. If the value of e/m is 1.76×10^{11} C/kg, the frequency of revolution of the electron is :-
- (1) 62.8 MHz (2) 6.28 MHz
 (3) 1 GHz (4) 100 MHz

7. Which of the following combinations should be selected for better tuning of an L-C-R circuit used for communication ?

- (1) $R = 15 \Omega$, $L = 3.5$ H, $C = 30 \mu\text{F}$
 (2) $R = 25 \Omega$, $L = 1.5$ H, $C = 45 \mu\text{F}$
 (3) $R = 20 \Omega$, $L = 1.5$ H, $C = 35 \mu\text{F}$
 (4) $R = 25 \Omega$, $L = 2.5$ H, $C = 45 \mu\text{F}$

8. A uniform magnetic field is restricted within a region of radius r . The magnetic field changes with time at a rate $\frac{d\vec{B}}{dt}$. Loop 1 of radius $R > r$ encloses the region r and loop 2 of radius R is outside the region of magnetic field as shown in the figure below. Then the e.m.f. generated is :-



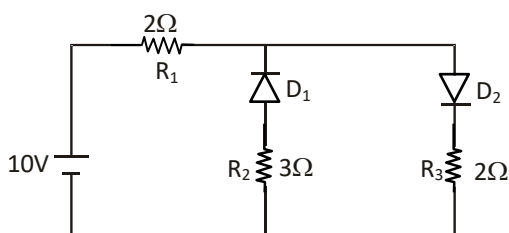
- (1) $-\frac{d\vec{B}}{dt} \pi R^2$ in loop 1 and zero in loop 2
 (2) $-\frac{d\vec{B}}{dt} \pi r^2$ in loop 1 and zero in loop 2
 (3) Zero in loop 1 and zero in loop 2
 (4) $-\frac{d\vec{B}}{dt} \pi r^2$ in loop 1 and $-\frac{d\vec{B}}{dt} \pi R^2$ in loop 2

9. The potential differences across the resistance, capacitance and inductance are 80 V, 40 V and 100 V respectively in an L-C-R circuit. The power factor of this circuit is :-
 (1) 0.8 (2) 1.0 (3) 0.4 (4) 0.5
10. A $100\ \Omega$ resistance and a capacitor of $100\ \Omega$ reactance are connected in series across a 220 V source. When the capacitor is 50% charged, the peak value of the displacement current is :-
 (1) 4.4 A (2) $11\sqrt{2}$ A
 (3) 2.2 A (4) 11 A
11. Two identical glass ($\mu_g = 3/2$) equiconvex lenses of focal length f each are kept in contact. The space between the two lenses is filled with water ($\mu_w = 4/3$). The focal length of the combination is :-
 (1) $4f/3$ (2) $3f/4$ (3) $f/3$ (4) f
12. An air bubble in a glass slab with refractive index 1.5 (near normal incidence) is 5 cm deep when viewed from one surface and 3 cm deep when viewed from the opposite face. The thickness (in cm) of the slab is :-
 (1) 12 (2) 16 (3) 8 (4) 10
13. The interference pattern is obtained with two coherent light sources of intensity ratio n . In the interference pattern, the ratio $\frac{I_{\max} - I_{\min}}{I_{\max} + I_{\min}}$ will be :-
 (1) $\frac{\sqrt{n}}{(n+1)^2}$ (2) $\frac{2\sqrt{n}}{(n+1)^2}$
 (3) $\frac{\sqrt{n}}{n+1}$ (4) $\frac{2\sqrt{n}}{n+1}$
14. A person can see clearly objects only when they lie between 50 cm and 400 cm from his eyes. In order to increase the maximum distance of distinct vision to infinity, the type and power of the correcting lens, the person has to use, will be :-
 (1) concave, - 0.2 diopter
 (2) convex, + 0.15 diopter
 (3) convex, + 2.25 diopter
 (4) concave, - 0.25 diopter
15. A linear aperture whose width is 0.02 cm is placed immediately in front of a lens of focal length 60 cm. The aperture is illuminated normally by a parallel beam of wavelength 5×10^{-5} cm. The distance of the first dark band of the diffraction pattern from the centre of the screen is :-
 (1) 0.20 cm (2) 0.15 cm
 (3) 0.10 cm (4) 0.25 cm
16. Electrons of mass m with de-Broglie wavelength λ fall on the target in an X-ray tube. The cutoff wavelength (λ_0) of the emitted X-ray is :-
 (1) $\lambda_0 = \frac{2m^2c^2\lambda^3}{h^2}$ (2) $\lambda_0 = \lambda$
 (3) $\lambda_0 = \frac{2mc\lambda^2}{h}$ (4) $\lambda_0 = \frac{2h}{mc}$
17. Photons with energy 5 eV are incident on a cathode C in a photoelectric cell. The maximum energy of emitted photoelectrons is 2 eV. When photons of energy 6 eV are incident on C, no photoelectrons will reach the anode A, if the stopping potential of A relative to C is :-
 (1) - 1 V (2) - 3 V (3) + 3 V (4) + 4 V
18. If an electron in a hydrogen atom jumps from the 3rd orbit to the 2nd orbit, it emits a photon of wavelength λ . When it jumps from the 4th orbit to the 3rd orbit, the corresponding wavelength of the photon will be :-
 (1) $\frac{20}{7}\lambda$ (2) $\frac{20}{13}\lambda$
 (3) $\frac{16}{25}\lambda$ (4) $\frac{9}{16}\lambda$
19. The half-life of a radioactive substance is 30 minutes. The time (in minutes) taken between 40% decay and 85% decay of the same radioactive substance is :-
 (1) 45 (2) 60
 (3) 15 (4) 30

20. For CE transistor amplifier, the audio signal voltage across the collector resistance of $2\text{ k}\Omega$ is 4 V . If the current amplification factor of the transistor is 100 and the base resistance is $1\text{ k}\Omega$, then the input signal voltage is :-

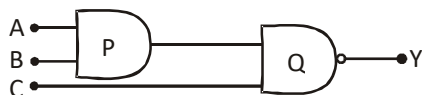
(1) 30 mV (2) 15 mV
(3) 10 mV (4) 20 mV

21. The given circuit has two ideal diodes connected as shown in the figure below. The current flowing through the resistance R_1 will be :-



(1) 1.43 A (2) 3.13 A
(3) 2.5 A (4) 10.0 A

22. What is the output Y in the following circuit, when all the three inputs A,B,C are first 0 and then 1?



(1) $1,0$ (2) $1,1$
(3) $0,1$ (4) $0,0$

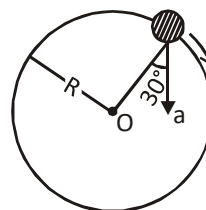
23. Planck's constant (h), speed of light in vacuum (c) and Newton's gravitational constant (G) are three fundamental constants. Which of the following combinations of these has the dimension of length?

(1) $\sqrt{\frac{hc}{G}}$
(2) $\sqrt{\frac{Gc}{h^{3/2}}}$
(3) $\frac{\sqrt{hG}}{c^{3/2}}$
(4) $\frac{\sqrt{hG}}{c^{5/2}}$

24. Two cars P and Q start from a point at the same time in a straight line and their positions are represented by $x_p(t) = at + bt^2$ and $x_Q(t) = ft - t^2$. At what time do the cars have the same velocity?

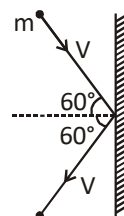
(1) $\frac{a+f}{2(1+b)}$ (2) $\frac{f-a}{2(1+b)}$
(3) $\frac{a-f}{1+b}$ (4) $\frac{a+f}{2(b-1)}$

25. In the given figure, $a = 15\text{ m/s}^2$ represents the total acceleration of a particle moving in the clockwise direction in a circle of radius $R = 2.5\text{ m}$ at a given instant of time. The speed of the particle is :-



(1) 5.7 m/s (2) 6.2 m/s
(3) 4.5 m/s (4) 5.0 m/s

26. A rigid ball of mass m strikes a rigid wall at 60° and gets reflected without loss of speed as shown in the figure below. The value of impulse imparted by the wall on the ball will be :-



(1) $\frac{mV}{2}$ (2) $\frac{mV}{3}$ (3) mV (4) $2mV$

27. A bullet of mass 10 g moving horizontally with a velocity of 400 ms^{-1} strikes a wooden block of mass 2 kg which is suspended by a light inextensible string of length 5 m . As a result, the centre of gravity of the block is found to rise a vertical distance of 10 cm . The speed of the bullet after it emerges out horizontally from the block will be :-

(1) 120 ms^{-1} (2) 160 ms^{-1}
(3) 100 ms^{-1} (4) 80 ms^{-1}

28. Two identical balls A and B having velocities of 0.5 m/s and -0.3 m/s respectively collide elastically in one dimension. The velocities of B and A after the collision respectively will be :-

(1) -0.3 m/s and 0.5 m/s
 (2) 0.3 m/s and 0.5 m/s
 (3) -0.5 m/s and 0.3 m/s
 (4) 0.5 m/s and -0.3 m/s

29. A particle moves from a point $(-2\hat{i} + 5\hat{j})$ to $(4\hat{j} + 3\hat{k})$ when a force of $(4\hat{i} + 3\hat{j})$ N is applied.

How much work has been done by the force ?

(1) 5 J (2) 2 J (3) 8 J (4) 11 J

30. Two rotating bodies A and B of masses m and $2m$ with moments of inertia I_A and I_B ($I_B > I_A$) have equal kinetic energy of rotation. If L_A and L_B be their angular momentum respectively, then :-

(1) $L_B > L_A$
 (2) $L_A > L_B$
 (3) $L_A = \frac{L_B}{2}$
 (4) $L_A = 2L_B$

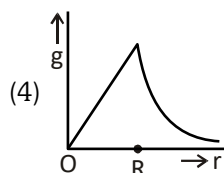
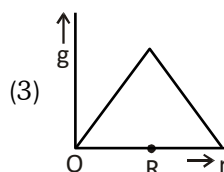
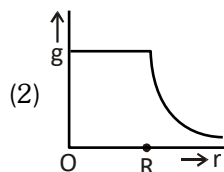
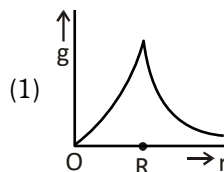
31. A solid sphere of mass m and radius R is rotating about its diameter. A solid cylinder of the same mass and same radius is also rotating about its geometrical axis with an angular speed twice that of the sphere. The ratio of their kinetic energies of rotation ($E_{\text{sphere}}/E_{\text{cylinder}}$) will be :-

(1) 1 : 4 (2) 3 : 1
 (3) 2 : 3 (4) 1 : 5

32. A light rod of length ℓ has two masses m_1 and m_2 attached to its two ends. The moment of inertia of the system about an axis perpendicular to the rod and passing through the centre of mass is :-

(1) $(m_1 + m_2)\ell^2$ (2) $\sqrt{m_1 m_2}\ell^2$
 (3) $\frac{m_1 m_2}{m_1 + m_2}\ell^2$ (4) $\frac{m_1 + m_2}{m_1 m_2}\ell^2$

33. Starting from the centre of the earth having radius R , the variation of g (acceleration due to gravity) is shown by :-



34. A satellite of mass m is orbiting the earth (of radius R) at a height h from its surface. The total energy of the satellite in terms of g_0 , where g_0 is the value of acceleration due to gravity at the earth's surface, is :-

(1) $\frac{2mg_0 R^2}{R+h}$
 (2) $-\frac{2mg_0 R^2}{R+h}$
 (3) $\frac{mg_0 R^2}{2(R+h)}$
 (4) $-\frac{mg_0 R^2}{2(R+h)}$

35. A rectangular film of liquid is extended from $(4 \text{ cm} \times 2 \text{ cm})$ to $(5 \text{ cm} \times 4 \text{ cm})$. If the work done is $3 \times 10^{-4} \text{ J}$, the value of the surface tension of the liquid is :-

(1) 0.2 Nm^{-1} (2) 8.0 Nm^{-1}
 (3) 0.250 Nm^{-1} (4) 0.125 Nm^{-1}

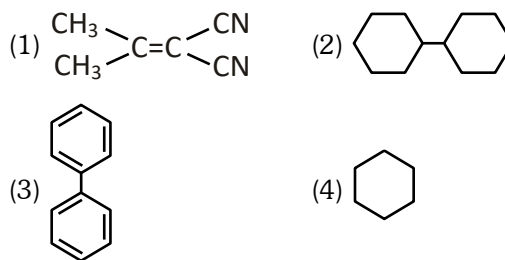
- 36.** Three liquids of densities ρ_1 , ρ_2 and ρ_3 (with $\rho_1 > \rho_2 > \rho_3$), having the same value of surface tension T , rise to the same height in three identical capillaries. The angles of contact θ_1 , θ_2 and θ_3 obey:-
- (1) $\frac{\pi}{2} < \theta_1 < \theta_2 < \theta_3 < \pi$
 - (2) $\pi > \theta_1 > \theta_2 > \theta_3 > \frac{\pi}{2}$
 - (3) $\frac{\pi}{2} > \theta_1 > \theta_2 > \theta_3 \geq 0$
 - (4) $0 \leq \theta_1 < \theta_2 < \theta_3 < \frac{\pi}{2}$
- 37.** Two identical bodies are made of a material for which the heat capacity increases with temperature. One of these is at 100°C , while the other one is at 0°C . If the two bodies are brought into contact, then, assuming no heat loss, the final common temperature is :-
- (1) less than 50°C but greater than 0°C
 - (2) 0°C
 - (3) 50°C
 - (4) more than 50°C
- 38.** A body cools from a temperature $3T$ to $2T$ in 10 minutes. The room temperature is T . Assume that Newton's law of cooling is applicable. The temperature of the body at the end of next 10 minutes will be :-
- (1) $\frac{4}{3}T$
 - (2) T
 - (3) $\frac{7}{4}T$
 - (4) $\frac{3}{2}T$
- 39.** One mole of an ideal monatomic gas undergoes a process described by the equation $PV^3 = \text{constant}$. The heat capacity of the gas during this process is
- (1) $2R$
 - (2) R
 - (3) $\frac{3}{2}R$
 - (4) $\frac{5}{2}R$
- 40.** The temperature inside a refrigerator is $t_2^\circ\text{C}$ and the room temperature is $t_1^\circ\text{C}$. The amount of heat delivered to the room for each joule of electrical energy consumed ideally will be :-
- (1) $\frac{t_2 + 273}{t_1 - t_2}$
 - (2) $\frac{t_1 + t_2}{t_1 + 273}$
 - (3) $\frac{t_1}{t_1 - t_2}$
 - (4) $\frac{t_1 + 273}{t_1 - t_2}$
- 41.** A given sample of an ideal gas occupies a volume V at a pressure P and absolute temperature T . The mass of each molecule of the gas is m . Which of the following gives the density of the gas ?
- (1) $P/(kTV)$
 - (2) mkT
 - (3) $P/(kT)$
 - (4) $Pm/(kT)$
- 42.** A body of mass m is attached to the lower end of a spring whose upper end is fixed. The spring has negligible mass. When the mass m is slightly pulled down and released, it oscillates with a time period of 3s. When the mass m is increased by 1 kg, the time period of oscillations becomes 5 s. The value of m in kg is :-
- (1) $\frac{16}{9}$
 - (2) $\frac{9}{16}$
 - (3) $\frac{3}{4}$
 - (4) $\frac{4}{3}$
- 43.** The second overtone of an open organ pipe has the same frequency as the first overtone of a closed pipe L metre long. The length of the open pipe will be
- (1) $\frac{L}{2}$
 - (2) $4L$
 - (3) L
 - (4) $2L$
- 44.** Three sound waves of equal amplitudes have frequencies $(n - 1)$, n , $(n + 1)$. They superimpose to give beats. The number of beats produced per second will be :-
- (1) 3
 - (2) 2
 - (3) 1
 - (4) 4
- 45.** An electric dipole is placed at an angle of 30° with an electric field intensity $2 \times 10^5 \text{ N/C}$. It experiences a torque equal to 4 Nm. The charge on the dipole, if the dipole length is 2 cm, is :-
- (1) 5 mC
 - (2) 7 μC
 - (3) 8 mC
 - (4) 2 mC

46. Hot concentrated sulphuric acid is a moderately strong oxidizing agent. Which of the following reactions does not show oxidizing behaviour ?
- (1) $C + 2H_2SO_4 \rightarrow CO_2 + 2SO_2 + 2H_2O$
 - (2) $CaF_2 + H_2SO_4 \rightarrow CaSO_4 + 2HF$
 - (3) $Cu + 2H_2SO_4 \rightarrow CuSO_4 + SO_2 + 2H_2O$
 - (4) $3S + 2H_2SO_4 \rightarrow 3SO_2 + 2H_2O$
47. Which of the following pairs of d-orbitals will have electron density along the axis ?
- (1) $d_{z^2}, d_{x^2-y^2}$
 - (2) $d_{xy}, d_{x^2-y^2}$
 - (3) d_{z^2}, d_{xz}
 - (4) d_{xz}, d_{yz}
48. The correct geometry and hybridization for XeF_4 are:
- (1) Planar triangle, sp^3d^3
 - (2) square planar, sp^3d^2
 - (3) octahedral, sp^3d^2
 - (4) trigonal bipyramidal, sp^3d
49. Among the following which one is a wrong statement?
- (1) SeF_4 and CH_4 have same shape
 - (2) I_3^+ has bent geometry
 - (3) PH_5 and $BiCl_5$ do not exist
 - (4) $p\pi-d\pi$ bonds are present in SO_2
50. The correct increasing order of trans-effect of the following species is :
- (1) $Br^- > CN^- > NH_3 > C_6H_5^-$
 - (2) $CN^- > Br^- > C_6H_5^- > NH_3$
 - (3) $NH_3 > CN^- > Br^- > C_6H_5^-$
 - (4) $CN^- > C_6H_5^- > Br^- > NH_3$
51. Which one of the following statements related to lanthanons is **incorrect** ?
- (1) All the lanthanons are much more reactive than aluminium
 - (2) $Ce(+4)$ solutions are widely used as oxidizing agent in volumetric analysis
 - (3) Europium shows +2 oxidation state.
 - (4) The basicity decreases as the ionic radius decreases from Pr to Lu.
52. Jahn-Teller effect **not** observed in high spin complexes of :-
- (1) d^4
 - (2) d^9
 - (3) d^7
 - (4) d^8

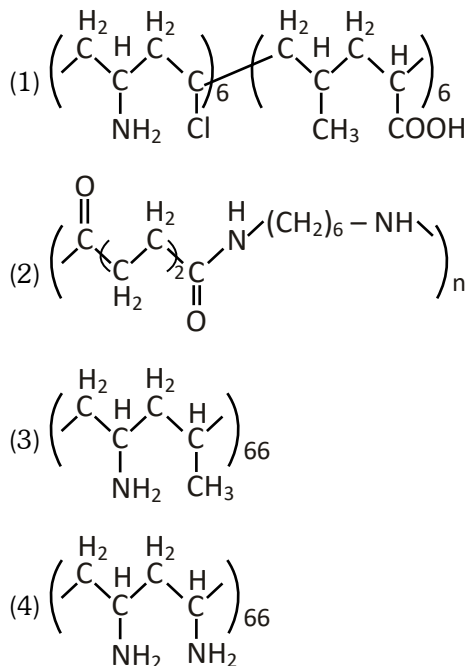
53. Which of the following can be used as the halide component for Friedel-Crafts reaction ?

- (1) Chloroethene
- (2) Isopropyl chloride
- (3) Chlorobenzene
- (4) Bromobenzene

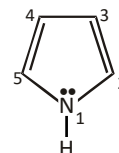
54. In which of the following molecules, all atoms are coplanar ?



55. Which one of the following structures represents nylon 6,6 polymer ?



56. In pyrrole



The electron density is maximum on :-

- (1) 2 and 4
- (2) 2 and 5
- (3) 2 and 3
- (4) 3 and 4

57. Which of the following compounds shall not produced propene by reaction with HBr followed by elimination or direct only by elimination reaction ?

- (1) $\text{H}_2\text{C}=\text{C}=\text{O}$ (2) $\text{H}_3\text{C}-\text{CH}_2-\text{CH}_2\text{Br}$
 (3) $\text{H}_2\text{C}-\text{CH}_2$ (4) $\text{H}_3\text{C}-\text{CH}_2-\text{CH}_2\text{OH}$
 $\quad \quad \quad \text{CH}_2$

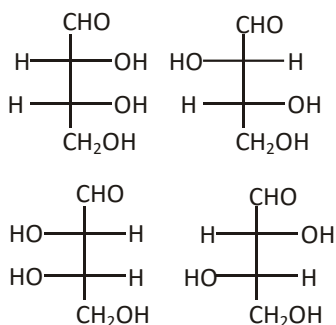
58. Which one of the following nitro-compounds does not react with nitrous acid ?

- (1) $\text{H}_3\text{C}-\text{C}(\text{NO}_2)-\text{CH}_3$ (2) $\text{H}_3\text{C}-\text{C}(\text{CH}_3)(\text{NO}_2)-\text{CHO}$
 (3) $\text{H}_3\text{C}-\text{CH}_2-\text{CH}_2\text{NO}_2$ (4) $\text{H}_3\text{C}-\text{CH}(\text{CH}_3)-\text{CH}_2\text{NO}_2$

59. The central dogma of molecular genetics states that the genetic information flows from :-

- (1) $\text{DNA} \rightarrow \text{RNA} \rightarrow \text{Proteins}$
 (2) $\text{DNA} \rightarrow \text{RNA} \rightarrow \text{Carbohydrates}$
 (3) $\text{Amino acids} \rightarrow \text{Proteins} \rightarrow \text{DNA}$
 (4) $\text{DNA} \rightarrow \text{Carbohydrates} \rightarrow \text{Proteins}$

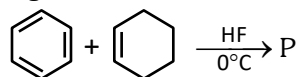
60. The **correct** corresponding order names of four aldoses with configuration given below



respectively, is :-

- (1) L-erythrose, L-threose, D-erythrose, D-threose
 (2) D-erythrose, D-threose, L-erythrose, L-threose
 (3) L-erythrose, L-threose, L-erythrose, D-threose
 (4) D-threose, D-erythrose, L-threose, L-erythrose

61. In the given reaction



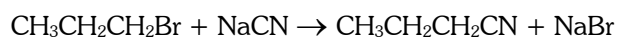
the product P is :-

- (1)
- (2)
- (3)
- (4)

62. A given nitrogen-containing aromatic compound (A) reacts with Sn/HCl , followed by HNO_2 to give an unstable compound (B). (B), on treatment with phenol, forms a beautiful coloured compound (C) with the molecular formula $\text{C}_{12}\text{H}_{10}\text{N}_2\text{O}$. The structure of compound (A) is :-

- (1)
- (2)
- (3)
- (4)

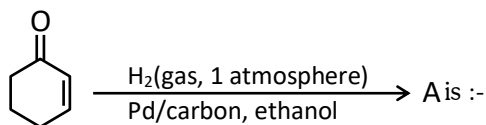
63. Consider the reaction



This reaction will be the fastest in

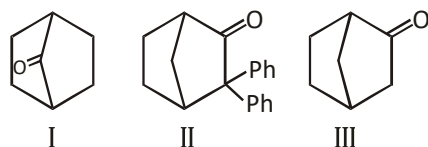
- (1) N,N'-dimethylformamide (DMF)
 (2) water
 (3) ethanol
 (4) methanol

64. The **correct** structure of the product A formed in the reaction



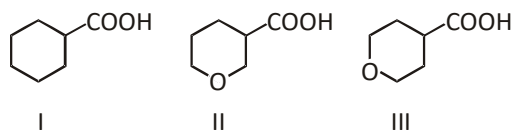
- (1)
 (2)
 (3)
 (4)

65. Which among the given molecules can exhibit tautomerism ?



- (1) Both I and II
 (2) Both II and III
 (3) III only
 (4) Both I and III

66. The **correct** order of acidic strengths of the carboxylic acids



is

- (1) III > II > I (2) II > I > III
 (3) I > II > III (4) II > III > I

67. The compound that will react most readily with gaseous bromine has the formula

- (1) C_4H_{10} (2) C_2H_4
 (3) C_3H_6 (4) C_2H_2

68. Which one of the following compounds shows the presence of intramolecular hydrogen bond ?

- (1) Cellulose
 (2) Concentrated acetic acid
 (3) H_2O_2
 (4) HCN

69. The molar conductivity of a 0.5 mol/dm^3 solution of AgNO_3 with electrolytic conductivity of $5.76 \times 10^{-3} \text{ S cm}^{-1}$ at 298 K is

- (1) $0.086 \text{ S cm}^2/\text{mol}$ (2) $28.8 \text{ S cm}^2/\text{mol}$
 (3) $2.88 \text{ S cm}^2/\text{mol}$ (4) $11.52 \text{ S cm}^2/\text{mol}$

70. The decomposition of phosphine (PH_3) on tungsten at low pressure is a first-order reaction. It is because the

- (1) rate is independent of the surface coverage
 (2) rate of decomposition is very slow
 (3) rate is proportional to the surface coverage
 (4) rate is inversely proportional to the surface coverage

71. The coagulation values in millimoles per litre of the electrolytes used for the coagulation of As_2S_3 are given below :

I. (NaCl) = 52,

II. (BaCl_2) = 0.69,

III. (MgSO_4) = 0.22

The **correct** order of their coagulating power is

- (1) III > II > I (2) III > I > II
 (3) I > II > III (4) II > I > III

72. During the electrolysis of molten sodium chloride, the time required to produce 0.10 mol of chlorine gas using a current of 3 amperes is

- (1) 220 minutes (2) 330 minutes
 (3) 55 minutes (4) 110 minutes

73. How many electrons can fit in the orbital for which $n = 3$ and $\ell = 1$?

- (1) 10 (2) 14 (3) 2 (4) 6

74. For a sample of perfect gas when its pressure is changed isothermally from p_i to p_f , the entropy change is given by

(1) $\Delta S = nRT \ln \left(\frac{p_f}{p_i} \right)$ (2) $\Delta S = RT \ln \left(\frac{p_i}{p_f} \right)$

(3) $\Delta S = nR \ln \left(\frac{p_f}{p_i} \right)$ (4) $\Delta S = nR \ln \left(\frac{p_i}{p_f} \right)$

75. The van't Hoff factor (i) for a dilute aqueous solution of the strong electrolyte barium hydroxide is
(1) 2 (2) 3 (3) 0 (4) 1
76. The percentage of pyridine (C_5H_5N) that forms pyridinium ion ($C_5H_5N^+H$) in a 0.10 M aqueous pyridine solution (K_b for $C_5H_5N = 1.7 \times 10^{-9}$) is
(1) 0.77% (2) 1.6%
(3) 0.0060% (4) 0.013%
77. In calcium fluoride, having the fluorite structure, the coordination numbers for calcium ion (Ca^{2+}) and fluoride ion (F^-) are
(1) 8 and 4 (2) 4 and 8
(3) 4 and 2 (4) 6 and 6
78. If the E°_{cell} for a given reaction has a negative value, which of the following gives the **correct** relationships for the values of ΔG° and K_{eq} ?
(1) $\Delta G^\circ < 0$; $K_{eq} > 1$ (2) $\Delta G^\circ < 0$; $K_{eq} < 1$
(3) $\Delta G^\circ > 0$; $K_{eq} < 1$ (4) $\Delta G^\circ > 0$; $K_{eq} > 1$
79. Which one of the following is **incorrect** for ideal solution ?
(1) $\Delta P = P_{obs} - P_{calculated \text{ by Raoult's law}} = 0$
(2) $\Delta G_{mix} = 0$
(3) $\Delta H_{mix} = 0$
(4) $\Delta U_{mix} = 0$
80. The solubility of $AgCl(s)$ with solubility product 1.6×10^{-10} in 0.1 M NaCl solution would be
(1) 1.6×10^{-11} M (2) zero
(3) 1.26×10^{-5} M (4) 1.6×10^{-9} M
81. Suppose the elements X and Y combine to form two compounds XY_2 and X_3Y_2 . When 0.1 mole of XY_2 weighs 10 g and 0.05 mole of X_3Y_2 weighs 9 g, the atomic weights of X and Y are
(1) 20, 30 (2) 30, 20 (3) 40, 30 (4) 60, 40
82. The number of electrons delivered at the cathode during electrolysis by a current of 1 ampere in 60 seconds is (charge on electron = 1.60×10^{-19} C)
(1) 3.75×10^{20} (2) 7.48×10^{23}
(3) 6×10^{23} (4) 6×10^{20}
83. Boric acid is an acid because its molecule
(1) accepts OH^- from water releasing proton
(2) combines with proton from water molecule
(3) contains replaceable H^+ ion
(4) gives up a proton
84. AlF_3 is soluble in HF only in presence of KF. It is due to the formation of
(1) AlH_3 (2) $K[AlF_3H]$
(3) $K_3[AlF_3H_3]$ (4) $K_3[AlF_6]$
85. Zinc can be coated on iron to produce galvanized iron but the reverse is not possible. It is because
(1) zinc has lower negative electrode potential than iron
(2) zinc has higher negative electrode potential than iron
(3) zinc is lighter than iron
(4) zinc has lower melting point than iron
86. The suspension of slaked lime in water is known as
(1) milk of lime
(2) aqueous solution of slaked lime
(3) limewater
(4) quicklime
87. The hybridizations of atomic orbitals of nitrogen in NO_2^+ , NO_3^- and NH_4^+ respectively are
(1) sp , sp^2 and sp^3 (2) sp^2 , sp and sp^3
(3) sp , sp^3 and sp^2 (4) sp^2 , sp^3 and sp
88. Which of the following fluoro-compounds is most likely to behave as a Lewis base ?
(1) CF_4 (2) SiF_4 (3) BF_3 (4) PF_3
89. Which of the following pairs of ions is isoelectronic and isostructural ?
(1) SO_3^{2-} , NO_3^- (2) ClO_3^- , SO_3^{2-}
(3) CO_3^{2-} , NO_3^- (4) ClO_3^- , CO_3^{2-}
90. In context with beryllium, which one of the following statements is **incorrect** ?
(1) Its salts rarely hydrolyze.
(2) Its hydride is electron-deficient and polymeric.
(3) It is rendered passive by nitric acid.
(4) it forms Be_2C .

91. Which one of the following generates new genetic combinations leading to variation ?
 (1) Sexual reproduction
 (2) Nucellar polyembryony
 (3) Vegetative reproduction
 (4) Parthenogenesis

92. Match **column-I** with **column-II** and select the correct option using the codes given below :

Column-I		Column-II	
(a)	Pistils fused together	(i)	Gametogenesis
(b)	Formation of gametes	(ii)	Pistillate
(c)	Hyphae of higher Ascomycetes	(iii)	Syncarpous
(d)	Unisexual female flower	(iv)	Dikaryotic

a b c d

- | | | | |
|---------|-----|----|-----|
| (1) i | ii | iv | iii |
| (2) iii | i | iv | ii |
| (3) iv | iii | i | ii |
| (4) ii | i | iv | iii |

93. In majority of angiosperms :
 (1) reduction division occurs in the megaspore mother cells
 (2) a small central cell is present in the embryo sac
 (3) egg has a filiform apparatus
 (4) there are numerous antipodal cells
94. Pollination in water hyacinth and water lily is brought about by the agency of :
 (1) birds (2) bats
 (3) water (4) insects or wind
95. The ovule of an angiosperm is technically equivalent to :
 (1) megaspore mother cell
 (2) megaspore
 (3) megasporangium
 (4) megasporophyll
96. Taylor conducted the experiment to prove semiconservative mode of chromosome replication on :
 (1) *Drosophila melanogaster*
 (2) *E. coli*
 (3) *Vinca rosea*
 (4) *Vicia faba*
97. The mechanism that causes a gene to move from one linkage group to another is called :
 (1) Translocation
 (2) Crossing-over
 (3) Inversion
 (4) Duplication

98. The equivalent of a structural gene is :

- (1) Operon (2) Recon
 (3) Muton (4) Cistron

99. A true breeding plant is :

- (1) near homozygous and produces offspring of its own kind
 (2) always homozygous recessive in its genetic constitution
 (3) one that is able to breed on its own
 (4) produced due to cross-pollination among unrelated plants

100. Which of the following rRNAs acts as structural RNA as well as ribozyme in bacteria ?

- (1) 23 S rRNA (2) 5.8 S rRNA
 (3) 5 S rRNA (4) 18 S rRNA

101. Stirred-tank bioreactors have been designed for :

- (1) availability of oxygen throughout the process
 (2) ensuring anaerobic conditions in the culture vessel
 (3) purification of product
 (4) addition of preservatives to the product

102. A foreign DNA and plasmid cut by the same restriction endonuclease can be joined to form a recombinant plasmid using :

- (1) Polymerase-III (2) Ligase
 (3) *Eco* RI (4) *Taq* polymerase

103. Which of the following is **not** a component of downstream processing ?

- (1) Preservation (2) Expression
 (3) Separation (4) Purification

104. Which of the following restriction enzymes produces blunt ends ?

- (1) *Xho* I (2) *Hind* III
 (3) *Sal* I (4) *Eco* RV

105. Which kind of therapy was given in 1990 to a four year old girl with adenosine deaminase (ADA) deficiency ?

- (1) Immunotherapy (2) Radiation therapy
 (3) Gene therapy (4) Chemotherapy

106. How many hot spots of biodiversity in the world have been identified till date by Norman Myers ?

- (1) 34 (2) 43 (3) 17 (4) 25

107. The primary producers of the deep-sea hydrothermal vent ecosystem are :

- (1) Blue-green algae
 (2) Coral reefs
 (3) Green algae
 (4) Chemosynthetic bacteria

- 108.** Which of the following is correct for r-selected species ?
 (1) Small number of progeny with small size
 (2) Small number of progeny with large size
 (3) Large number of progeny with small size
 (4) Large number of progeny with large size
- 109.** If '+' sign is assigned to beneficial interaction '-' sign to detrimental and '0' sign to neutral interaction, then the population interaction represented by '+' '-' refers to :
 (1) Commensalism (2) Parasitism
 (3) Mutualism (4) Amensalism
- 110.** Which of the following is **correctly** matched ?
 (1) *Parthenium hysterophorus* – Threat to biodiversity
 (2) Stratification – Population
 (3) Aerenchyma – *Opuntia*
 (4) Age pyramid – Biome
- 111.** Red list contains data or information on :
 (1) threatened species
 (2) marine vertebrates only
 (3) all economically important plants
 (4) plants whose products are in international trade
- 112.** Which one of the following is **wrong** for fungi ?
 (1) They are heterotrophic
 (2) They are both unicellular and multicellular
 (3) They are eukaryotic
 (4) All fungi possess a purely cellulosic cell wall
- 113.** Methanogens belong to :
 (1) Dinoflagellates (2) Slime moulds
 (3) Eubacteria (4) Archaeobacteria
- 114.** Select the **wrong** statement :
 (1) Diatoms are chief producers in the oceans
 (2) Diatoms are microscopic and float passively in water
 (3) The walls of diatoms are easily destructible
 (4) 'Diatomaceous earth' is formed by the cell walls of diatoms.
- 115.** The label of a herbarium sheet **does not** carry information on :
 (1) Local names (2) height of the plant
 (3) date of collection (4) name of collector
- 116.** Conifers are adapted to tolerate extreme environmental conditions because of :
 (1) thick cuticle (2) presence of vessels
 (3) broad hardy leaves (4) superficial stomata
- 117.** Which one of the following statements is **wrong**?
 (1) Agar-agar is obtained from *Gelidium* and *Gracilaria*
 (2) *Laminaria* and *Sargassum* are used as food
 (3) Algae increase the level of dissolved oxygen in the immediate environment
 (4) Algin is obtained from red algae, and carrageen from brown algae.
- 118.** The term 'polyadelphous' is related to :-
 (1) Corolla (2) Calyx
 (3) Gynoecium (4) Androecium
- 119.** How many plants among *Indigofera*, *Sesbania*, *Salvia*, *Allium*, *Aloe*, mustard, groundnut, radish, gram and turnip have stamens with different lengths in their flowers ?
 (1) Five (2) Six (3) Three (4) Four
- 120.** Radial symmetry is found in the flowers of :-
 (1) *Pisum* (2) *Cassia*
 (3) *Brassica* (4) *Trifolium*
- 121.** Free-central placentation is found in :-
 (1) *Brassica* (2) *Citrus*
 (3) *Dianthus* (4) *Argemone*
- 122.** Cortex is the region found between :-
 (1) Endodermis and pith
 (2) Endodermis and vascular bundle
 (3) Epidermis and stele
 (4) Pericycle and endodermis
- 123.** The balloon-shaped structures called tyloses :-
 (1) Are extensions of xylem parenchyma cells into vessels
 (2) Are linked to the ascent of sap through xylem vessels
 (3) Originate in the lumen of vessels
 (4) Characterize the sapwood
- 124.** A non-proteinaceous enzyme is :-
 (1) Ligase
 (2) Deoxyribonuclease
 (3) Lysozyme
 (4) Ribozyme
- 125.** Select the **mismatch** :-
 (1) Protists-Eukaryotes
 (2) Methanogens-Prokaryotes
 (3) Gas vacuoles-Green bacteria
 (4) Large central vacuoles - Animal cells
- 126.** Select the **wrong** statement :-
 (1) Cyanobacteria lack flagellated cells.
 (2) *Mycoplasma* is a wall-less microorganism
 (3) Bacterial cell wall is made up of peptidoglycan.
 (4) Pili and fimbriae are mainly involved in motility of bacterial cells
- 127.** A cell organelle containing hydrolytic enzymes is:-
 (1) Ribosome (2) Mesosome
 (3) Lysosome (4) Microsome
- 128.** During cell growth, DNA synthesis takes place in:-
 (1) G₂ phase (2) M phase
 (3) S phase (4) G₁ phase

- 129.** Which of the following biomolecules is common to respiration-mediated breakdown of fats, carbohydrates and proteins ?
 (1) Pyruvic acid
 (2) Acetyl CoA
 (3) Glucose-6-phosphate
 (4) Fructose 1,6-bisphosphate
- 130.** A few drops of sap were collected by cutting across a plant stem by a suitable method. The sap was tested chemically. Which one of the following test results indicates that it is phloem sap ?
 (1) Low refractive index
 (2) Absence of sugar
 (3) Acidic
 (4) Alkaline
- 131.** You are given a tissue with its potential for differentiation in an artificial culture. Which of the following pairs of hormones would you add to the medium to secure shoots as well as roots ?
 (1) Auxin and abscisic acid
 (2) Gibberellin and abscisic acid
 (3) IAA and gibberellin
 (4) Auxin and cytokinin
- 132.** Phytochrome is a :-
 (1) Lipoprotein (2) Chromoprotein
 (3) Flavoprotein (4) Glycoprotein
- 133.** Which is essential for the growth of root tip ?
 (1) Ca (2) Mn (3) Zn (4) Fe
- 134.** The process which makes major difference between C_3 and C_4 plants is :-
 (1) Photorespiration (2) Respiration
 (3) Glycolysis (4) Calvin cycle
- 135.** Which one of the following statements is **not** correct?
 (1) In potato, banana and ginger, the plantlets arise from the internodes present in the modified stem.
 (2) Water hyacinth, growing in the standing water, drains oxygen from water that leads to the death of fishes.
 (3) Offspring produced by the asexual reproduction are called clone
 (4) Microscopic, motile asexual reproductive structures are called zoospores.
- 136.** The part of nephron involved in active reabsorption of sodium is :-
 (1) Bowman's capsule
 (2) Descending limb of Henle's loop
 (3) Distal convoluted tubule
 (4) Proximal convoluted tubule
- 137.** Which of the following is hormone releasing IUD?
 (1) Lippes loop (2) Cu7
 (3) LNG-20 (4) Multiload 375
- 138.** Which of the following is **incorrect** regarding vasectomy ?
 (1) Vasa deferentia is cut and tied
 (2) Irreversible sterility
 (3) No sperm occurs in seminal fluid
 (4) No sperm occurs in epididymis
- 139.** Embryo with more than 16 blastomeres formed due to *in vitro* fertilization is transferred into :-
 (1) Fimbriae (2) Cervix
 (3) Uterus (4) Fallopian tube
- 140.** Which of the following depicts the **correct** pathway of transport of sperms ?
 (1) Rete testis → Vas deferens → Efferent ductules → Epididymis
 (2) Efferent ductules → Rete testis → Vas deferens → Epididymis
 (3) Rete testis → Efferent ductules → Epididymis → Vas deferens
 (4) Rete testis → Epididymis → Efferent ductules → Vas deferens
- 141.** Match **Column-I** with **Column-II** and select the correct option using the codes given below :-
- | Column I | | Column II | |
|----------|---------------|-----------|---------------------------|
| a | Mons pubis | i | Embryo formation |
| b | Antrum | ii | Sperm |
| c | Trophectoderm | iii | Female external genitalia |
| d | Nebenkern | iv | Graafian follicle |
- Codes :**
- | | | | |
|---------|----|-----|----|
| a | b | c | d |
| (1) iii | i | iv | ii |
| (2) i | iv | iii | ii |
| (3) iii | iv | ii | i |
| (4) iii | iv | i | ii |
- 142.** Several hormones like hCG, hPL, estrogen, progesterone are produced by :-
 (1) Fallopian tube (2) Pituitary
 (3) Ovary (4) Placenta
- 143.** If a colour-blind man marries a woman who is homozygous for normal colour vision, the probability of their son being colour-blind is :-
 (1) 0.75 (2) 1 (3) 0 (4) 0.5
- 144.** Genetic drift operates in :-
 (1) Non-reproductive population
 (2) Slow reproductive population
 (3) Small isolated population
 (4) Large isolated population

- 145.** In Hardy-Weinberg equation, the frequency of heterozygous individual is represented by :-
 (1) pq (2) q^2 (3) p^2 (4) $2pq$
- 146.** The chronological order of human evolution from early to the recent is :-
 (1) *Ramapithecus* → *Homo habilis* → *Australopithecus* → *Homo erectus*
 (2) *Australopithecus* → *Homo habilis* → *Ramapithecus* → *Homo erectus*
 (3) *Australopithecus* → *Ramapithecus* → *Homo habilis* → *Homo erectus*
 (4) *Ramapithecus* → *Australopithecus* → *Homo habilis* → *Homo erectus*
- 147.** Which of the following is the **correct** sequence of events in the origin of life ?
 I. Formation of protobionts
 II. Synthesis of organic monomers
 III. Synthesis of organic polymers
 IV. Formation of DNA-based genetic systems
 (1) II, III, I, IV (2) II, III, IV, I
 (3) I, II, III, IV (4) I, III, II, IV
- 148.** A molecule that can act as a genetic material must fulfill the traits given below, **except** :-
 (1) It should be unstable structurally and chemically
 (2) It should provide the scope for slow changes that are required for evolution
 (3) It should be able to express itself in the form of 'Mendelian characters'
 (4) It should be able to generate its replica
- 149.** DNA-dependent RNA polymerase catalyzes transcription on one strand of the DNA which is called the :-
 (1) Alpha strand (2) Antistrand
 (3) Template strand (4) Coding strand
- 150.** Interspecific hybridization is the mating of :-
 (1) Superior males and females of different breeds
 (2) More closely related individuals within same breed for 4-6 generations
 (3) Animals within same breed without having common ancestors
 (4) Two different related species

- 151.** Which of the following is **correct** regarding AIDS causative agent HIV ?
 (1) HIV is unenveloped retrovirus.
 (2) HIV does not escape but attacks the acquired immune response.
 (3) HIV is enveloped virus containing one molecule of single-stranded RNA and one molecule of reverse transcriptase.
 (4) HIV is enveloped virus that contains two identical molecules of single-stranded RNA and two molecules of reverse transcriptase.
- 152.** Among the following edible fishes, which one is a marine fish having rich source of omega-3 fatty acids?
 (1) Mrigala (2) Mackerel
 (3) Mystus (4) Mangur
- 153.** Match **Column -I** with **Column-II** and select the correct option using the codes given below

Column-I		Column-II	
(a)	Citric acid	(i)	Trichoderma
(b)	Cyclosporin A	(ii)	Clostridium
(c)	Statins	(iii)	Aspergillus
(d)	Butyric acid	(iv)	Monascus

Codes :

- | | a | b | c | d |
|-----|----------|----------|----------|----------|
| (1) | i | iv | ii | iii |
| (2) | iii | iv | i | ii |
| (3) | iii | i | ii | iv |
| (4) | iii | i | iv | ii |
- 154.** Biochemical Oxygen Demand (BOD) may **not** be a good index for pollution for water bodies receiving effluents from :-
 (1) Petroleum industry
 (2) Sugar industry
 (3) Domestic sewage
 (4) Dairy industry
- 155.** The principle of competitive exclusion was stated by :-
 (1) MacArthur (2) Verhulst and Pearl
 (3) C. Darwin (4) G.F. Gause
- 156.** Which of the following National Parks is home to the famous musk deer or hangul?
 (1) Eaglenest Wildlife Sanctuary, Arunachal Pradesh
 (2) Dachigam National Park, Jammu & Kashmir
 (3) Keibul Lamjao National Park, Manipur
 (4) Bandhavgarh National Park, Madhya Pradesh

- 157.** A lake which is rich in organic waste may result in:-
 (1) Increased population of fish due to lots of nutrients.
 (2) Mortality of fish due to lack of oxygen
 (3) Increased population of aquatic organisms due to minerals
 (4) Drying of the lake due to algal bloom
- 158.** The highest DDT concentration in aquatic food chain shall occur in :-
 (1) crab (2) eel
 (3) phytoplankton (4) seagull
- 159.** Which of the following sets of diseases is caused by bacteria?
 (1) Tetanus and mumps
 (2) Herpes and influenza
 (3) Cholera and tetanus
 (4) Typhoid and smallpox
- 160.** Match **Column-I** with **Column-II** for housefly classification and select the correct option using the codes given below :

Column-I		Column-II	
a	Family	(i)	Diptera
b	Order	(ii)	Arthropoda
c	Class	(iii)	Muscidae
d	Phylum	(iv)	Insecta

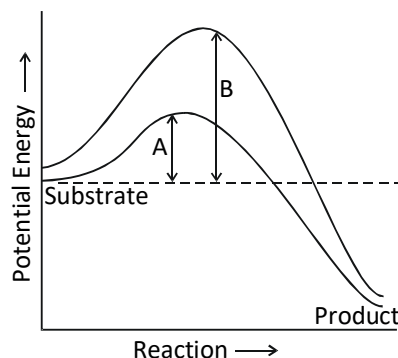
Codes :

- | | | | | |
|-----|----------|----------|----------|----------|
| | a | b | c | d |
| (1) | iv | iii | ii | i |
| (2) | iv | ii | i | iii |
| (3) | iii | i | iv | ii |
| (4) | iii | ii | iv | i |
- 161.** Choose the **correct** statement.
 (1) All reptiles have a three-chambered heart.
 (2) All pisces have gills covered by an operculum.
 (3) All mammals are viviparous.
 (4) All cyclostomes do not possess jaws and paired fins.
- 162.** Study the four statements (A-D) given below and select the two correct ones out of them :
 (A) Definition of biological species was given by Ernst Mayr.
 (B) Photoperiod does not affect reproduction in plants.
 (C) Binomial nomenclature system was given by R.H. Whittaker.
 (D) In unicellular organisms, reproduction is synonymous with growth.

The two **correct statements are**

- | | |
|-------------|-------------|
| (1) A and D | (2) A and B |
| (3) B and C | (4) C and D |

- 163.** In male cockroaches, sperms are stored in which part of the reproductive system?
 (1) Testes (2) Vas deferens
 (3) Seminal vesicles (4) Mushroom glands
- 164.** Smooth muscles are :-
 (1) Involuntary, cylindrical, striated
 (2) Voluntary, spindle-shaped, uninucleate
 (3) Involuntary, fusiform, non-striated
 (4) Voluntary, multinucleate, cylindrical
- 165.** Oxidative phosphorylation is :-
 (1) Addition of phosphate group to ATP.
 (2) Formation of ATP by energy released from electrons removed during substrate oxidation.
 (3) Formation of ATP by transfer of phosphate group from a substrate to ADP
 (4) Oxidation of phosphate group in ATP
- 166.** Which of the following is the least likely to be involved in stabilizing the three-dimensional folding of most proteins?
 (1) Hydrophobic interaction
 (2) Ester bonds
 (3) Hydrogen bonds
 (4) Electrostatic interaction
- 167.** Which of the following describes the given graph **correctly**?



- | |
|---|
| (1) Endothermic reaction with energy A in absence of enzyme and B in presence of enzyme |
| (2) Exothermic reaction with energy A in absence of enzyme and B in presence of enzyme |
| (3) Endothermic reaction with energy A in presence of enzyme and B in absence of enzyme |
| (4) Exothermic reaction with energy A in presence of enzyme and B in absence of enzyme. |

168. When cell has stalled DNA replication fork, which checkpoint should be predominantly activated?

- (1) M (2) Both G₂/M and M
(3) G₁/S (4) G₂/M

169. Match the stages of meiosis in **Column-I** to their characteristic features in **Column-II** and select the correct option using the codes given below :

Column-I		Column-II	
a	Pachytene	i	Pairing of homologous chromosomes
b	Metaphase-I	ii	Terminalization of chiasmata
c	Diakinesis	iii	Crossing over takes place
d	Zygotene	iv	Chromosomes align at equatorial plate

Codes :

- | | | | | |
|-----|----------|----------|----------|----------|
| | a | b | c | d |
| (1) | ii | iv | iii | i |
| (2) | iv | iii | ii | i |
| (3) | iii | iv | ii | i |
| (4) | i | iv | ii | iii |

170. Which hormones do stimulate the production of pancreatic juice and bicarbonate?

- (1) Cholecystokinin and secretin
(2) Insulin and glucagon
(3) Angiotensin and epinephrine
(4) Gastrin and insulin

171. The partial pressure of oxygen in the alveoli of the lungs is :-

- (1) Less than that in the blood
(2) Less than that of carbon dioxide
(3) Equal to that in the blood
(4) More than that in the blood

172. Choose the **correct** statement.

- (1) Photoreceptors in the human eye are depolarized during darkness and become hyperpolarized in response to the light stimulus.
(2) Receptors do not produce graded potentials.
(3) Nociceptors respond to changes in pressure.
(4) Meissner's corpuscles are thermo receptors.

173. Graves' disease is caused due to :-

- (1) Hyposecretion of adrenal gland
(2) Hypersecretion of adrenal gland
(3) Hyposecretion of thyroid gland
(4) Hypersecretion of thyroid gland

174. Name the ion responsible for unmasking of active sites for myosin for cross-bridge activity during muscle contraction.

- (1) Sodium (2) Potassium
(3) Calcium (4) Magnesium

175. Name the blood cells, whose reduction in number can cause clotting disorder, leading to excessive loss of blood from the body.

- (1) Neutrophils (2) Thrombocytes
(3) Erythrocytes (4) Leucocytes

176. Name a peptide hormone which acts mainly on hepatocytes, adipocytes and enhances cellular glucose uptake and utilization.

- (1) Secretin (2) Gastrin
(3) Insulin (4) Glucagon

177. Osteoporosis, an age-related disease of skeletal system, may occur due to :-

- (1) Decreased level of estrogen
(2) Accumulation of uric acid leading to inflammation of joints.
(3) Immune disorder affecting neuro-muscular junction leading to fatigue.
(4) High concentration of Ca⁺⁺ and Na⁺.

178. Serum differs from blood in :-

- (1) Lacking clotting factors
(2) Lacking antibodies
(3) Lacking globulins
(4) Lacking albumins

179. Lungs do not collapse between breaths and some air always remains in the lungs which can never be expelled because :-

- (1) There is a positive intrapleural pressure
(2) Pressure in the lungs is higher than the atmospheric pressure.
(3) There is a negative pressure in the lungs.
(4) There is a negative intra plular pressure pulling at the lung walls

180. The posterior pituitary gland is **not** a 'true' endocrine gland because :-

- (1) It is under the regulation of hypothalamus
(2) It secretes enzymes
(3) It is provided with a duct
(4) It only stores and releases hormones

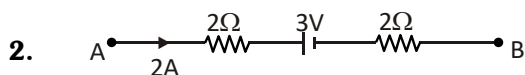
ANSWER KEY

NEET(II)-2016

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	1	2	1	4	4	3	1	2	1	3	2	1	4	4	2
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	3	2	1	2	4	3	1	3	2	1	3	1	4	1	1
Que.	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Ans.	4	3	4	4	4	4	4	4	2	4	4	2	4	2	4
Que.	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ans.	2	1	2	1	4	1	4	2	3	2	2	1	1	1	2
Que.	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Ans.	1	4	1	4	3	4	3	1	4	3	1	4	3	4	2
Que.	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
Ans.	4	1	3	2	4	3	1	1	4	2	1	1	4	2,3	1
Que.	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105
Ans.	1	2	1	4	3	4	1	4	1	1	1	2	2	4	3
Que.	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
Ans.	1	4	3	2	1	1	4	4	3	2	1	4	4	4	3
Que.	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135
Ans.	3	3	1	4	4	4	3	3	2	4	4	2	1	1	1
Que.	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
Ans.	4	3	4	3	3	4	4	3	3	4	4	1	1	3	4
Que.	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165
Ans.	4	2	4	1	4	2	2	4	3	3	4	1	3	3	2
Que.	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
Ans.	2	4	4	3	1	4	1	4	3	2	3	1	1	4	4

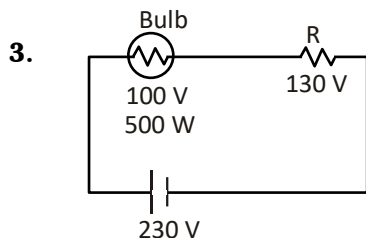
HINT - SHEET

1. Put $k_1 = k_2 = k_3 = k_4$ and check answer



$$V_B = V_A - (2 \times 2) - 3 - (2 \times 1)$$

$$\Rightarrow V_A - V_B = 9V$$



$$\text{Current through bulb} = \frac{P}{V} = \frac{500W}{100V} = 5A$$

$$\text{Therefore } R = \frac{130V}{5A} = 26\Omega$$

4. Since $\ell = 2\pi R = n(2\pi r) \Rightarrow r = \frac{R}{n}$

$$\text{For one turn } B = \frac{\mu_0 i}{2R} \text{ and}$$

$$\text{For } n \text{ turn } B' = \frac{\mu_0 n i}{2r} \Rightarrow B' = \frac{\mu_0 n^2 i}{2R} = n^2 B$$

5. $\tau = MB \sin 60^\circ$ (1)

$$W = MB (1 - \cos 60^\circ) \text{(2)}$$

From (1) and (2)

$$\frac{\tau}{W} = \frac{\sqrt{3}/2}{1/2} \Rightarrow \tau = W\sqrt{3}$$

6. $f = \frac{eB}{2\pi m}$

$$f = \frac{1.76 \times 10^{11} \times 3.57 \times 10^{-2}}{2 \times 3.14} \text{ Hz}$$

$$f = 10^9 \text{ Hz or } 1 \text{ GHz}$$

7. For better tuning, Q-factor must be high.

$$\therefore Q = \frac{\omega_0 L}{R} = \frac{1}{\sqrt{LC}} \left(\frac{L}{R} \right) = \frac{1}{R} \sqrt{\frac{L}{C}}$$

R and C should be small and L should be high.

8. For Loop 1

$$\epsilon_{\text{ind}} = -\frac{d\phi}{dt} = -A \left(\frac{dB}{dt} \right) \cos 0^\circ = -\pi r^2 \left(\frac{dB}{dt} \right)$$

For Loop 2, $\epsilon_{\text{ind}} = 0$ as no flux linkage

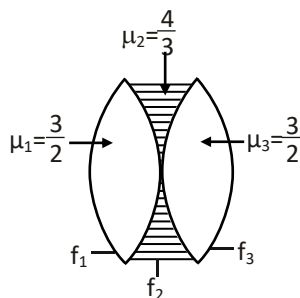
9. $\tan \phi = \frac{V_L - V_C}{V_R} = \frac{100 - 40}{80} = \frac{3}{4}$ or $\phi = 37^\circ$

$$\text{Power factor} = \cos \phi = \cos 37^\circ = \frac{4}{5} \text{ or } 0.8$$

10. $(i_d)_{\text{max}} = (i_c)_{\text{max}} = i_0 = \frac{\epsilon_0}{Z} = \frac{220\sqrt{2}}{\sqrt{100^2 + 100^2}} = 2.2A$

As we are asked amplitude of displacement current. So, need not worry about charge on capacitor.

- 11.



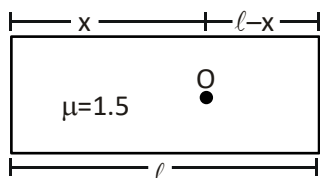
$$f_1 = f_3 = \frac{R}{2\left(\frac{3}{2} - 1\right)} = R = f \text{ (given)}$$

$$f_2 = \frac{-R}{2\left(\frac{4}{3} - 1\right)} = -\frac{3}{2}R = -\frac{3}{2}f$$

$$\frac{1}{f_{\text{eq}}} = \frac{1}{f_1} + \frac{1}{f_2} + \frac{1}{f_3} = \frac{1}{f} + \left(-\frac{2}{3f}\right) + \frac{1}{f}$$

$$\Rightarrow \frac{1}{f_{\text{eq}}} = \frac{4}{3f} \Rightarrow f_{\text{eq}} = \frac{3f}{4}$$

- 12.



$$\frac{x}{\mu} = 5\text{cm} \quad \dots\dots(i)$$

$$\frac{\ell - x}{\mu} = 3\text{cm} \quad \dots\dots(ii)$$

From (i) and (ii)

$$\ell = (5+3)\mu = 12\text{cm}$$

13. Let $\frac{I_1}{I_2} = \frac{n}{1}$

$$\frac{I_{\text{max}} - I_{\text{min}}}{I_{\text{max}} + I_{\text{min}}} = \frac{(\sqrt{I_1} + \sqrt{I_2})^2 - (\sqrt{I_1} - \sqrt{I_2})^2}{(\sqrt{I_1} + \sqrt{I_2})^2 + (\sqrt{I_1} - \sqrt{I_2})^2}$$

Dividing numerator and denominator by I_2

$$\text{required ratio} = \frac{2\sqrt{\frac{I_1}{I_2}}}{\left(\frac{I_1}{I_2} + 1\right)} = \frac{2\sqrt{n}}{n+1}$$

14. As we want to correct myopia. So, far point must go to infinity.

$$v = -4\text{ m}, u = -\infty, P = ?$$

$$P = \frac{1}{f} = \frac{1}{v} - \frac{1}{u} = \frac{1}{-4} - \frac{1}{-\infty} = -0.25\text{ D}$$

(-) implies concave mirror

15. $f = D = 60\text{ cm}$

For first minima,

$$y = \frac{\lambda D}{a} = \frac{5 \times 10^{-7} \times 60 \times 10^{-2}}{2 \times 10^{-4}} \text{ m} = 0.15\text{ cm}$$

16. $\lambda = \frac{h}{p} \Rightarrow p = \frac{h}{\lambda}$

$$\text{KE of electrons} = E = \frac{p^2}{2m} = \frac{h^2}{2m\lambda^2}$$

$$\text{Also in X-ray } \lambda_0 = \frac{hc}{E} \Rightarrow \lambda_0 = \frac{2mc\lambda^2}{h}$$

17. $eV_s = \frac{1}{2}mv_{\text{max}}^2 = hv - \phi_0$

$$2 = 5 - \phi_0 \Rightarrow \phi_0 = 3\text{ eV}$$

In second case

$$eV_s = 6 - 3 = 3\text{ eV} \Rightarrow V_s = 3\text{ V.}$$

$$\therefore V_{AC} = -3\text{ V}$$

18. Transition : $3 \rightarrow 2 \Rightarrow$ Wavelength λ .

Transition : $4 \rightarrow 3 \Rightarrow$ Wavelength $\lambda' = ?$

$$\frac{1}{\lambda} = RZ^2 \left(\frac{1}{2^2} - \frac{1}{3^2} \right) \Rightarrow \frac{\lambda'}{\lambda} = \frac{20}{7} \Rightarrow \lambda' = \frac{20\lambda}{7}$$

19. decay $40\% \rightarrow 85\%$

Remaining $60\% \rightarrow 15\%$

$$60\% \xrightarrow{t_{1/2}} 30\% \xrightarrow{t_{1/2}} 15\%$$

$$\therefore t = 2t_{1/2} = 60\text{ min.}$$

20. $\beta = 100$; $V_0 = 4V$; $R_i = 10^3 \text{ W}$;

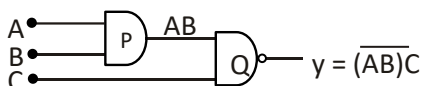
$$R_0 = 2 \times 10^3 \text{ W}; V_i = ?$$

$$A_v = \frac{V_0}{V_i} = \beta \frac{R_0}{R_i} \Rightarrow \frac{4}{V_i} = 100 \times \frac{2 \times 10^3}{10^3}$$

$$\Rightarrow V_i = 20 \text{ mV}$$

21. Current will not flow through D_1 as it is reverse biased. Current will flow through cell, R_1 , D_2 and R_3 .

$$\therefore i = \frac{10}{2+2} = 2.5 \text{ A}$$

22. 

$$\text{for } A = B = C = 0; y = 1$$

$$\text{for } A = B = C = 1; y = 0$$

23. $\ell \propto h^x G^y c^z$

$$M^0 L^1 T^0 = (M L^2 T^{-1})^x (M^{-1} L^3 T^{-2})^y (L T^{-1})^z$$

$$= M^{x-y} L^{2x+3y+z} T^{-x-2y-z}$$

Equating :

$$\left. \begin{aligned} x - y &= 0 \\ 2x + 3y + z &= 1 \\ -x - 2y - z &= 0 \end{aligned} \right\} \Rightarrow x = \frac{1}{2}; y = \frac{1}{2}; z = -\frac{3}{2}$$

$$\Rightarrow \ell \propto \frac{\sqrt{hG}}{c^{3/2}}$$

24. $x_P(t) = at + bt^2$ $x_Q(t) = ft - t^2$

$$v_P = a + 2bt \quad v_Q = f - 2t$$

$$\text{as } v_P = v_Q$$

$$a + 2bt = f - 2t$$

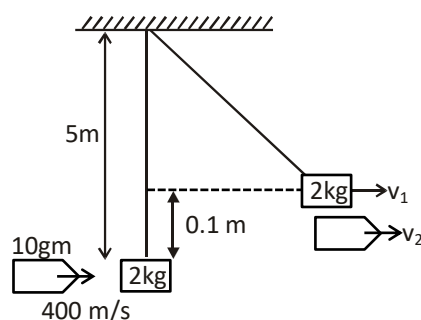
$$\Rightarrow t = \frac{f-a}{2(1+b)}$$

25. Centripetal acceleration = $\frac{v^2}{R} = a \cos 30^\circ$

$$\Rightarrow v = \sqrt{aR \cos 30^\circ} = \sqrt{15 \times 2.5 \times \frac{\sqrt{3}}{2}} = 5.7 \text{ m/s}$$

26. Impulse = $|\Delta p| = m|\Delta V| = m(2V \cos 60^\circ) = mV$

- 27.



Applying momentum conservation

$$\frac{10}{1000} \times 400 + 0 = 2 \times v_1 + \frac{10}{1000} \times v_2$$

$$\Rightarrow 4 = 2v_1 + 0.01v_2 \quad \dots\dots(1)$$

Applying work energy theorem for block

$$W = \Delta KE$$

$$\Rightarrow 2 \times 10 \times 0.1 = \frac{1}{2} \times 2 \times v_1^2$$

$$\Rightarrow v_1 = \sqrt{2} = 1.4 \text{ m/s}$$

Putting the value of v_1 in equation (1)

$$4 = 2 \times 1.4 + 0.01 v_2 \Rightarrow v_2 = 120 \text{ m/s}$$

28. Since both bodies are identical and collision is elastic. Therefore velocities will be interchanged after collision.

$$v_A = -0.3 \text{ m/s and } v_B = 0.5 \text{ m/s}$$

29. $\vec{s} = \vec{r}_f - \vec{r}_i = 2\hat{i} - \hat{j} + 3\hat{k}$

$$W = \vec{F} \cdot \vec{s} = (4\hat{i} + 3\hat{j}) \cdot [2\hat{i} - \hat{j} + 3\hat{k}] = 8 - 3 = 5 \text{ J}$$

30. $K_A = K_B \Rightarrow \frac{L_A^2}{2I_A} = \frac{L_B^2}{2I_B}$

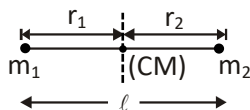
$$\text{As } I_B > I_A \quad \text{So, } L_A^2 < L_B^2 \Rightarrow L_A < L_B$$

31. $E_{\text{sphere}} = \frac{1}{2} I_s \omega^2 = \frac{1}{2} \times \frac{2}{5} MR^2 \times \omega^2$

$$E_{\text{cylinder}} = \frac{1}{2} I_c (2\omega)^2 = \frac{1}{2} \times \frac{MR^2}{2} \times 4\omega^2$$

$$\frac{E_{\text{sphere}}}{E_{\text{cylinder}}} = \frac{1}{5}$$

32.



$$r_1 = \frac{m_2 \ell}{m_1 + m_2}, \quad r_2 = \frac{m_1 \ell}{m_1 + m_2}$$

$$I_{cm} = m_1 r_1^2 + m_2 r_2^2 = \frac{m_1 m_2}{m_1 + m_2} \ell^2$$

OR

$$I_{cm} = \mu \ell^2 = \frac{m_1 m_2}{m_1 + m_2} \ell^2$$

33. $g = \left(\frac{GM_e}{R_e^3} \right) r$ for $0 < r \leq R_e \Rightarrow g \propto r$

$g = \frac{GM_e}{r^2}$ for $r \geq R_e \Rightarrow g \propto \frac{1}{r^2}$

34. Total energy = $-\frac{GM_e m}{2(R+h)}$

$$\therefore g_0 = \frac{GM_e}{R^2} \Rightarrow M_e = \frac{g_0 R^2}{G}$$

$$\therefore \text{Energy} = -\frac{mg_0 R^2}{2(R+h)}$$

35. $W = T(2\Delta A)$ { $\Delta A = (20 - 8) \text{ cm}^2$ }

$$\Rightarrow T = \frac{W}{2\Delta A} = \frac{3 \times 10^{-4}}{2 \times 12 \times 10^{-4}} = 0.125 \text{ Nm}^{-1}$$

36. $h = \frac{2T \cos \theta}{\rho g r}$

As r, h, T are same, $\frac{\cos \theta}{\rho} = \text{constant}$

$$\Rightarrow \frac{\cos \theta_1}{\rho_1} = \frac{\cos \theta_2}{\rho_2} = \frac{\cos \theta_3}{\rho_3}$$

As $\rho_1 > \rho_2 > \rho_3$

$$\Rightarrow \cos \theta_1 > \cos \theta_2 > \cos \theta_3 \Rightarrow \theta_1 < \theta_2 < \theta_3$$

As water rises so θ must be acute

$$\text{So, } 0 \leq \theta_1 < \theta_2 < \theta_3 < \pi/2$$

37. Let θ be the final common temperature. Further, let s_c and s_h be the average heat capacities of the cold and hot (initially) bodies respectively (where $s_c < s_h$ given)

From, principle of calorimetry,

heat lost = heat gained

$$s_h(100^\circ\text{C} - \theta) = s_c \theta$$

$$\therefore \theta = \frac{s_h}{(s_h + s_c)} \times 100^\circ\text{C} = \frac{100^\circ\text{C}}{\left(1 + \frac{s_c}{s_h}\right)}$$

$$\therefore s_c / s_h < 1 \quad \therefore 1 + s_c / s_h < 2$$

$$\therefore \theta > \frac{100^\circ\text{C}}{2} \quad \text{or} \quad \theta > 50^\circ\text{C}$$

OR

Body at 100°C has more heat capacity than body at 0°C so final temperature must be greater than 50°C .

38. Newton's laws of cooling

$$\frac{T_1 - T_2}{t} = k \left(\frac{T_1 + T_2}{2} - T \right)$$

$$\frac{3T - 2T}{10} = k \left(\frac{5T - 2T}{2} \right) \Rightarrow \frac{T}{10} = k \left(\frac{3T}{2} \right) \dots(i)$$

$$\frac{2T - T'}{10} = k \left(\frac{2T + T'}{2} - T \right)$$

$$\Rightarrow \frac{2T - T'}{10} = k \left(\frac{T'}{2} \right) \dots(ii)$$

By solving (i) and (ii) $T' = \frac{3}{2}T$

39. $PV^x = \text{constant}$ (Polytropic process)

Heat capacity in polytropic process is given by

$$\left[C = C_V + \frac{R}{1-x} \right]$$

Given that $PV^3 = \text{constant} \Rightarrow x = 3 \dots(1)$

also gas is monoatomic so $C_V = \frac{3}{2}R \dots(2)$

by formula

$$C = \frac{3}{2}R + \frac{R}{1-3} = \frac{3}{2}R - \frac{R}{2} = R$$

40. Heat delivered = Q_1

$$\text{COP}(\beta) = \frac{Q_2}{W} = \frac{Q_1 - W}{W} = \frac{Q_1}{W} - 1 = \frac{T_2}{T_1 - T_2}$$

$$\Rightarrow \frac{Q_1}{W} = 1 + \frac{t_2 + 273}{t_1 - t_2} = \frac{t_1 + 273}{t_1 - t_2}$$

$$\Rightarrow \frac{Q_1}{1J} = \frac{t_1 + 273}{t_1 - t_2}$$

41. $\frac{P}{\rho} = \frac{RT}{M_w}$ (Ideal gas equation)

$$\Rightarrow \rho = \frac{PM_w}{RT} = \frac{P \times (mN_A)}{kN_A T} = \frac{Pm}{kT}$$

42. $T = 2\pi \sqrt{\frac{m}{k}}$

$$3 = 2\pi \sqrt{\frac{m}{k}} \dots(1)$$

$$5 = 2\pi \sqrt{\frac{m+1}{k}} \dots(2)$$

$$\frac{(1)^2}{(2)^2} \Rightarrow \frac{9}{25} = \frac{m}{m+1} \Rightarrow m = \frac{9}{16}$$

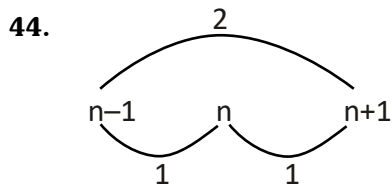
43. For second overtone (3rd harmonic) in open organ pipe,

$$\frac{3\lambda}{2} = \ell_0 \Rightarrow \lambda = \frac{2\ell_0}{3}$$

for first overtone (3rd harmonic) in closed organ pipe,

$$\frac{3\lambda}{4} = \ell_c \Rightarrow \lambda = \frac{4\ell_c}{3} = \frac{4L}{3}$$

$$\text{So, } \frac{2\ell_0}{3} = \frac{4L}{3} \Rightarrow \ell_0 = 2L$$



Now divide 1 second into 1, 1, 2 equal divisions

$$\frac{1}{1} \\ \frac{1}{1} \\ \frac{1}{2} \quad \frac{2}{2}$$

By eliminating common time instants, total maxima in one second is 2.

So, two beats per second will be heard.

45. $\tau = PE \sin \theta$

$$\tau = q\ell E \sin \theta$$

$$4 = q \times 2 \times 10^{-2} \times 2 \times 10^5 \sin 30^\circ$$

$$\Rightarrow q = 2 \text{ mC}$$

46. $\text{CaF}_2 + \text{H}_2\text{SO}_4 \rightarrow \text{CaSO}_4 + 2\text{HF}$

In this reaction, oxidation number of none of the atom is not changed. Hence H_2SO_4 is not acting as oxidising agent.

47. dz^2 and dx^2-y^2 has electron density concentrated on the axis.

48. $\text{XeF}_4, \text{AB}_4\text{L}_2 \rightarrow \text{sp}^3\text{d}^2$

→ geometry } square planar
→ shape }

49. (1) SeF_4 - sp^3d , lp = 1, shape = see-saw

CH_4 - sp^3 , lp = 0, shape = tetrahedral

- (2) I_3^+ - sp^3 , lp = 2, shape = bent/angular

- (3) PH_5 = d-orbital contraction absent

BiCl_5 = due to inert pair effect

(Bi^{+5} act as OA, Cl^- act as RA)

- (4) SO_2 : $\text{O}=\text{S}=\text{O}$

$\text{P}\pi\text{-d}\pi$, $\text{P}\pi\text{-P}\pi$ both type bonds are present

50. Trans effect order - $\text{CN}^- > \text{C}_6\text{H}_5^- > \text{Br}^- > \text{NH}_3$

51. (1) Lanthanoids are less reactive than aluminium due to high IP (Lanthanoid contraction)

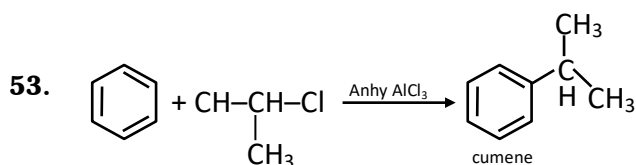
- (2) Ce^{+4} is good oxidising agent and easily converted into Ce^{+3}

- (3) $\text{Eu}(63) = 4f^7 5d^0 6s^2$, $\text{Eu}^{+2} = 4f^7$

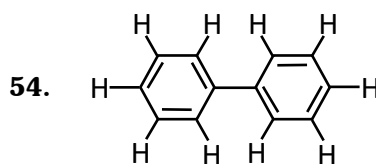
- (4) In lanthanoid series 'Ce' to Lu ionic radius regular decreases and covalent character increase, basic character of hydroxide decrease

52. John Teller effect explain axial distortion in perfect octahedral geometry. It is present in d^4 high spin, d^7 low spin and d^9 configurations which have odd number of electrons in eg set.

A weak John Teller effect is also present in d^7 high spin complex which has odd number of electrons in the set.

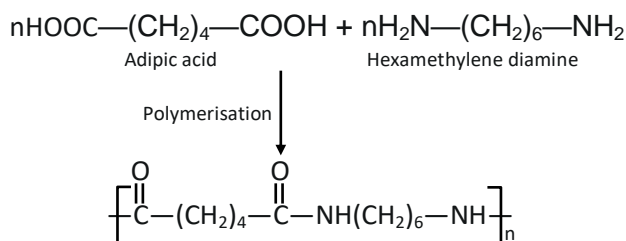


But in chlorobenzene, Bromobenzene, chloroethene lone pair of halogen are delocalised with p bonds, so attain double bond character.

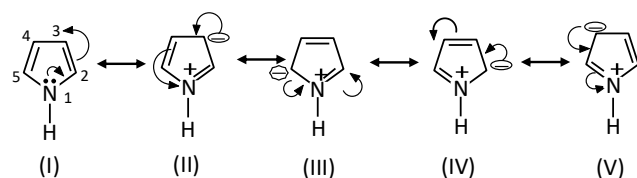


All carbons are sp^2 hybridised

- 55.



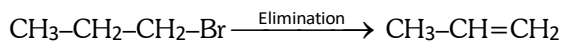
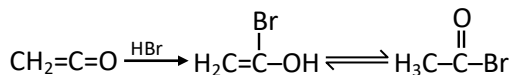
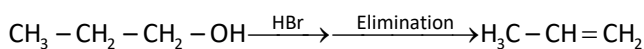
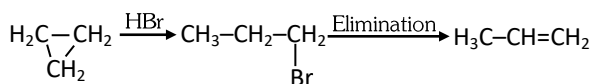
- 56.



Maximum electron density at (2) and (5)

as resonating structures III & IV are more stable than (II) & (V) so are major contributors.

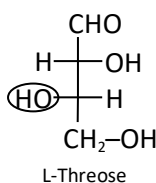
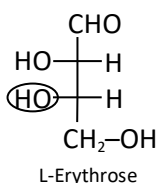
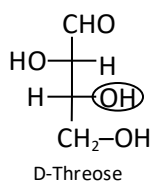
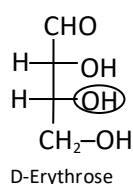
57.



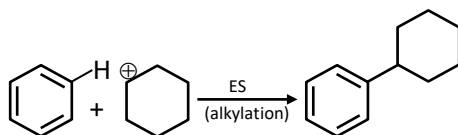
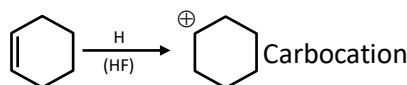
58. 3°-Nitro compound does not react with HNO_2 because of absence of $\alpha\text{-H}$

59. DNA $\xrightarrow{\text{Transcription}}$ RNA $\xrightarrow{\text{Translation}}$ Protein

60.

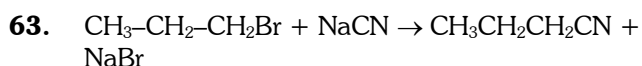
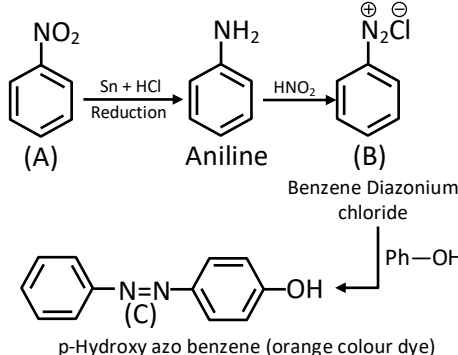


61.

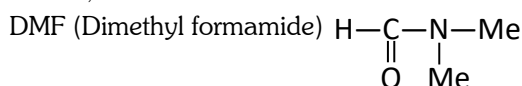


[Friedel Craft reaction]

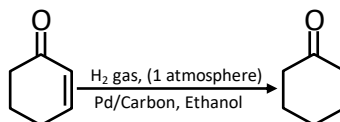
62.



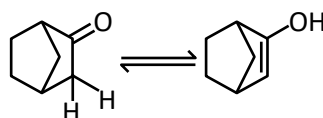
This reaction follows by $\text{S}_\text{N}2$ path, which is favoured by polar aprotic solvents like DMF, DMSO, etc.



64.

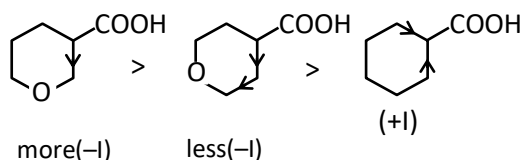


65.

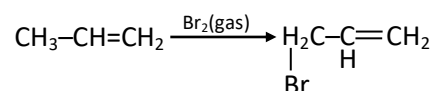


Keto form Enol form

66. Acidic Strength



67. Gaseous Bromine reacts with alkene to give allylic substituted product by free radical mechanism



68. In acetic acid, H_2O_2 and HCN inter molecular hydrogen bond present but in cellulose intramolecular hydrogen bond present.

69. $C = 0.5 \text{ mol / dm}^3$

$$k = 5.76 \times 10^{-3} \text{ S cm}^{-1}$$

$$T = 298 \text{ K}$$

$$\lambda_m = \frac{\kappa \times 1000}{M} = \frac{5.76 \times 10^{-3} \times 1000}{0.5} = 11.52$$

$$\text{Scm}^2/\text{mol}$$

70. The decomposition of PH_3 on tungsten at low pressure is a first order reaction because rate is proportional to the surface coverage.

71. Coagulation power $\propto \frac{1}{\text{coagulation value}}$

So, the order is III > II > I

72. $2\text{Cl}^- \rightarrow \text{Cl}_2(\text{g}) + 2\text{e}^-$

$$W = \frac{E}{96500} \times \text{it}$$

$$0.1 \times 71 = \frac{35.5}{96500} \times 3 \times t(\text{sec})$$

$$t(\text{s}) = 6433.33 \text{ sec}$$

$$t(\text{min}) = 107.22 \text{ min} \approx 110 \text{ min.}$$

73. $n = 3, l = 1 \Rightarrow 3\text{p}$

Total 2 electron can fit in the orbital of 3p

74. $\Delta S = nC_{pm} \ln \frac{T_f}{T_i} + nR \ln \frac{P_i}{P_f}$
For isothermal $T_i = T_f$, $\ln 1 = 0$
 $\Delta S = nR \ln \frac{P_i}{P_f}$
75. Ba(OH)_2 is strong electrolyte, so its 100% dissociation occurs in solution
 $\text{Ba(OH)}_2 \rightarrow \text{Ba}^{+2}(\text{aq}) + 2\text{OH}^{-}(\text{aq})$
Van't Hoff factor = total number of ions present in solution $i = 3$
76. Pyridine ($\text{C}_5\text{H}_5\text{N}$) is a weak base
 $K_b = C\alpha$
 $\alpha = \sqrt{\frac{1.7 \times 10^{-9}}{0.1}}$
 $\alpha = 1.30 \times 10^{-4}$
 $\% \alpha = 1.30 \times 10^{-4} \times 100$
 $\% \alpha = 0.013\%$
77. In CaF_2 , the coordination numbers for $\text{Ca}^{+2} = 8$
 $\text{F}^{-} = 4$
78. $\therefore E_{\text{cell}}^0 = -ve$
 $\therefore \Delta G^0 = -nF E_{\text{cell}}^0$
 $\Delta G^0 = +ve \Rightarrow \Delta G > 0$
 $\therefore \Delta G^0 = -2.303RT \log K_{\text{eq}}$
 $\therefore K_{\text{eq}} < 1$
79. For an ideal solution $\Delta H_{\text{mix}} = 0$
 $\Delta U_{\text{mix}} = 0$
 $\Delta S_{\text{mix}} \neq 0$
According to $\Delta G_{\text{mix}} = \Delta H_{\text{mix}} - T\Delta S_{\text{mix}}$
 $\Rightarrow \Delta G_{\text{mix}} \neq 0$
Incorrect answer, is $\Delta G_{\text{mix}} = 0$
80. $\text{NaCl(aq)} \rightarrow \text{Na}^{+}(\text{aq}) + \text{Cl}^{-}(\text{aq})$
0.1M 0 0
0 0.1M 0.1 + S
- $\text{AgCl(s)} \rightleftharpoons \text{Ag}^{+}(\text{aq}) + \text{Cl}^{-}(\text{aq})$
a 0 0
a - S S S + 0.1
 $K_{\text{sp}} = 1.6 \times 10^{-10} = [\text{Ag}^{+}][\text{Cl}^{-}] = S(0.1 + S)$
 $\therefore K_{\text{sp}}$ is small, S is neglected with respect to 0.1M
 $1.6 \times 10^{-10} = S \times 0.1$
 $S = 1.6 \times 10^{-9} \text{ M}$
81. Let atomic weight of x is A_x and y is A_y
 $n_{x_{y/2}} = 0.1 = \frac{10}{A_x + 2A_y}$

$$A_x + 2A_y = 100 \quad \dots(1)$$

$$n_{x_{y/2}} = 0.05 = \frac{9}{3A_x + 2A_y}$$

$$3A_x + 2A_y = 180 \quad \dots(2)$$

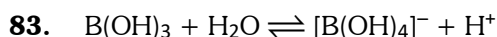
on solving eq. (1) and (2)

$$A_x = 40, A_y = 30$$

82. $Q = ne$

$$\text{i.t} = n.e$$

$$n = \frac{1 \times 60}{1.6 \times 10^{-19}} = 3.75 \times 10^{20} \text{ electrons}$$



85. Zinc has higher negative electrode potential than iron, so iron cannot be coated on zinc.

86. Aqueous solution of slaked lime \Rightarrow lime water
Suspension solution of slaked lime \Rightarrow milk of lime

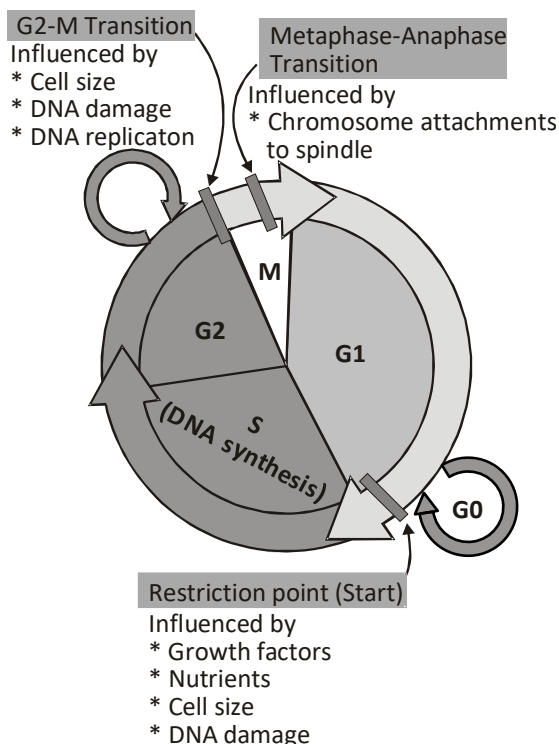
87. $\text{NO}_2^{+} = \text{sp}$ Linear
 $\text{NO}_3^{-} = \text{sp}^2$ Trigonal planar
 $\text{NH}_4^{+} = \text{sp}^3$ Tetrahedral

88. PF_3 act as Lewis base due to present of lone pair on P atom.

89. (2) In SO_3^{2-} , ClO_3^{-} , No. of electrons = 42,
Shape : Pyramidal
(3) In CO_3^{2-} , NO_3^{-} , No. of electrons = 32
Shape : trigonal planar

90. Be salts are covalent nature, so easily hydrolysed.

168.



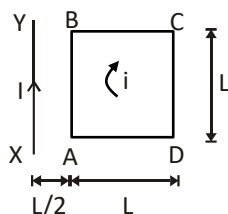
NEET(I) - 2016

1. From a disc of radius R and mass M , a circular hole of diameter R , whose rim passes through the centre is cut. What is the moment of inertia of the remaining part of the disc about a perpendicular axis, passing through the centre ?

- (1) $15 MR^2/32$ (2) $13 MR^2/32$
(3) $11 MR^2/32$ (4) $9 MR^2/32$

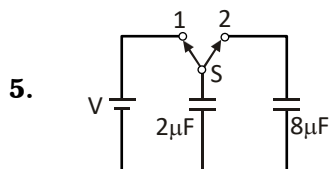
2. A square loop ABCD carrying a current i , is placed near and coplanar with a long straight conductor XY carrying a current I , the net force on the loop will be :-

- (1) $\frac{2\mu_0 Li}{3\pi}$
(2) $\frac{\mu_0 Li}{2\pi}$
(3) $\frac{2\mu_0 LiL}{3\pi}$
(4) $\frac{\mu_0 LiL}{2\pi}$



3. The magnetic susceptibility is negative for :
(1) diamagnetic material only
(2) paramagnetic material only
(3) ferromagnetic material only
(4) paramagnetic and ferromagnetic materials
4. A siren emitting a sound of frequency 800 Hz moves away from an observer towards a cliff at a speed of 15ms^{-1} . Then, the frequency of sound that the observer hears in the echo reflected from the cliff is :

- (Take velocity of sound in air = 330ms^{-1})
(1) 765 Hz (2) 800 Hz
(3) 838 Hz (4) 885 Hz



A capacitor of $2\mu\text{F}$ is charged as shown in the diagram. When the switch S is turned to position 2, the percentage of its stored energy dissipated is:

- (1) 0% (2) 20%
(3) 75% (4) 80%

6. In a diffraction pattern due to a single slit of width 'a', the first minimum is observed at an angle 30° when light of wavelength 5000\AA is incident on the slit. The first secondary maximum is observed at an angle of :

- (1) $\sin^{-1}\left(\frac{1}{4}\right)$ (2) $\sin^{-1}\left(\frac{2}{3}\right)$
(3) $\sin^{-1}\left(\frac{1}{2}\right)$ (4) $\sin^{-1}\left(\frac{3}{4}\right)$

7. At what height from the surface of earth the gravitation potential and the value of g are $-5.4 \times 10^7\text{ J kg}^{-2}$ and 6.0 ms^{-2} respectively? Take the radius of earth as 6400 km :

- (1) 2600 km (2) 1600 km
(3) 1400 km (4) 2000 km

8. Out of the following options which one can be used to produce a propagating electromagnetic wave?

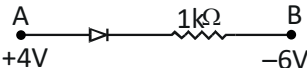
- (1) A charge moving at constant velocity
(2) A stationary charge
(3) A chargeless particle
(4) An accelerating charge

9. Two identical charged spheres suspended from a common point by two massless strings of lengths ℓ , are initially at a distance d ($d \ll \ell$) apart because of their mutual repulsion. The charges begin to leak from both the spheres at a constant rate. As a result, the spheres approach each other with a velocity v . Then v varies as a function of the distance x between the spheres, as :

- (1) $v \propto x^{\frac{1}{2}}$ (2) $v \propto x$
(3) $v \propto x^{-\frac{1}{2}}$ (4) $v \propto x^{-1}$

10. A uniform rope of length L and mass m_1 hangs vertically from a rigid support. A block of mass m_2 is attached to the free end of the rope. A transverse pulse of wavelength λ_1 is produced at the lower end of the rope. The wavelength of the pulse when it reaches the top of the rope is λ_2 . The ratio λ_2/λ_1 is :

- (1) $\sqrt{\frac{m_1}{m_2}}$ (2) $\sqrt{\frac{m_1 + m_2}{m_2}}$
(3) $\sqrt{\frac{m_2}{m_1}}$ (4) $\sqrt{\frac{m_1 + m_2}{m_1}}$

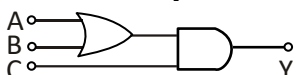
11. A refrigerator works between 4°C and 30°C . It is required to remove 600 calories of heat every second in order to keep the temperature of the refrigerated space constant. The power required is: (Take $1 \text{ cal} = 4.2 \text{ Joules}$)
- (1) 2.365 W (2) 23.65 W
(3) 236.5 W (4) 2365 W
12. An air column, closed at one end and open at the other, resonates with a tuning fork when the smallest length of the column is 50 cm. The next larger length of the column resonating with the same tuning fork is :
- (1) 66.7 cm (2) 100 cm
(3) 150 cm (4) 200 cm
13. Consider the junction diode as ideal. The value of current flowing through AB is :
- 
- (1) 0 A (2) 10^{-2} A
(3) 10^{-1} A (4) 10^{-3} A
14. The charge flowing through a resistance R varies with time t as $Q = at - bt^2$, where a and b are positive constants. The total heat produced in R is:
- (1) $\frac{a^3 R}{6b}$ (2) $\frac{a^3 R}{3b}$
(3) $\frac{a^3 R}{2b}$ (4) $\frac{a^3 R}{b}$
15. A black body is at a temperature of 5760 K . The energy of radiation emitted by the body at wavelength 250 nm is U_1 , at wavelength 500 nm is U_2 and that at 1000 nm is U_3 . Wien's constant, $b = 2.88 \times 10^6 \text{ nmK}$. Which of the following is correct?
- (1) $U_1 = 0$ (2) $U_3 = 0$
(3) $U_1 > U_2$ (4) $U_2 > U_1$
16. Coefficient of linear expansion of brass and steel rods are α_1 and α_2 . Lengths of brass and steel rods are ℓ_1 and ℓ_2 respectively. If $(\ell_2 - \ell_1)$ is maintained same at all temperatures, which one of the following relations holds good ?
- (1) $\alpha_1 \ell_2 = \alpha_2 \ell_1$ (2) $\alpha_1 \ell_2^2 = \alpha_2 \ell_1^2$
(3) $\alpha_1^2 \ell_2 = \alpha_2^2 \ell_1$ (4) $\alpha_1 \ell_1 = \alpha_2 \ell_2$
17. A npn transistor is connected in common emitter configuration in a given amplifier. A load resistance of 800Ω is connected in the collector circuit and the voltage drop across it is 0.8 V . If the current amplification factor is 0.96 and the input resistance of the circuit is 192Ω , the voltage gain and the power gain of the amplifier will respectively be :
- (1) 4, 3.84 (2) 3.69, 3.84
(3) 4, 4 (4) 4, 3.69
18. The intensity at the maximum in a Young's double slit experiment is I_0 . Distance between two slits is $d = 5\lambda$, where λ is the wavelength of light used in the experiment. What will be the intensity in front of one of the slits on the screen placed at a distance $D = 10 d$?
- (1) I_0 (2) $\frac{I_0}{4}$ (3) $\frac{3}{4} I_0$ (4) $\frac{I_0}{2}$
19. A uniform circular disc of radius 50 cm at rest is free to turn about an axis which is perpendicular to its plane and passes through its centre. It is subjected to a torque which produces a constant angular acceleration of 2.0 rad s^{-2} . Its net acceleration in ms^{-2} at the end of 2.0 s is approximately :
- (1) 8.0 (2) 7.0 (3) 6.0 (4) 3.0
20. An electron of mass m and a photon have same energy E . The ratio of de-Broglie wavelengths associated with them is :
- (1) $\frac{1}{c} \left(\frac{E}{2m} \right)^{\frac{1}{2}}$ (2) $\left(\frac{E}{2m} \right)^{\frac{1}{2}}$
(3) $c(2mE)^{\frac{1}{2}}$ (4) $\frac{1}{xc} \left(\frac{2m}{E} \right)^{\frac{1}{2}}$
(c being velocity of light)
21. A disk and a sphere of same radius but different masses roll off on two inclined planes of the same altitude and length. Which one of the two objects gets to the bottom of the plane first ?
- (1) Disk
(2) Sphere
(3) Both reach at the same time
(4) Depends on their masses
22. The angle of incidence for a ray of light at a refracting surface of a prism is 45° . The angle of prism is 60° . If the ray suffers minimum deviation through the prism, the angle of minimum deviation and refractive index of the material of the prism respectively, are :
- (1) 45° , $\frac{1}{\sqrt{2}}$ (2) 30° , $\sqrt{2}$
(3) 45° , $\sqrt{2}$ (4) 30° , $\frac{1}{\sqrt{2}}$

- 23.** When an α -particle of mass 'm' moving with velocity 'v' bombards on a heavy nucleus of charge 'Ze', its distance of closest approach from the nucleus depends on m as :
- (1) $\frac{1}{m}$ (2) $\frac{1}{\sqrt{m}}$ (3) $\frac{1}{m^2}$ (4) m
- 24.** A particle of mass 10 g moves along a circle of radius 6.4 cm with a constant tangential acceleration. What is the magnitude of this acceleration if the kinetic energy of the particle becomes equal to 8×10^{-4} J by the end of the second revolution after the beginning of the motion?
- (1) 0.1 m/s^2 (2) 0.15 m/s^2
(3) 0.18 m/s^2 (4) 0.2 m/s^2
- 25.** The molecules of a given mass of a gas have r.m.s. velocity of 200 ms^{-1} at 27°C and $1.0 \times 10^5 \text{ Nm}^{-2}$ pressure. When the temperature and pressure of the gas are respectively, 127°C and $0.05 \times 10^5 \text{ Nm}^{-2}$, the r.m.s. velocity of its molecules in ms^{-1} is:
- (1) $100\sqrt{2}$ (2) $\frac{400}{\sqrt{3}}$
(3) $\frac{100\sqrt{2}}{3}$ (4) $\frac{100}{3}$
- 26.** A long straight wire of radius a carries a steady current I. The current is uniformly distributed over its cross-section. The ratio of the magnetic fields B and B', at radial distances $\frac{a}{2}$ and 2a respectively, from the axis of the wire is :
- (1) $\frac{1}{4}$ (2) $\frac{1}{2}$ (3) 1 (4) 4
- 27.** A particle moves so that its position vector is given by $\vec{r} = \cos \omega t \hat{x} + \sin \omega t \hat{y}$. Where ω is a constant. Which of the following is true ?
- (1) Velocity and acceleration both are perpendicular to \vec{r} .
(2) Velocity and acceleration both are parallel to \vec{r}
(3) Velocity is perpendicular to \vec{r} and acceleration is directed towards the origin
(4) Velocity is perpendicular to \vec{r} and acceleration is directed away from the origin
- 28.** What is the minimum velocity with which a body of mass m must enter a vertical loop of radius R so that it can complete the loop?
- (1) \sqrt{gR} (2) $\sqrt{2gR}$
(3) $\sqrt{3gR}$ (4) $\sqrt{5gR}$
- 29.** When a metallic surface is illuminated with radiation of wavelength λ , the stopping potential is V. If the same surface is illuminated with radiation of wavelength 2λ , the stopping potential is $\frac{V}{4}$. The threshold wavelength for the metallic surface is :-
- (1) 4λ (2) 5λ
(3) $\frac{5}{2}\lambda$ (4) 3λ
- 30.** A gas is compressed isothermally to half its initial volume. The same gas is compressed separately through an adiabatic process until its volume is again reduced to half. Then :-
- (1) Compressing the gas isothermally will require more work to be done.
(2) Compressing the gas through adiabatic process will require more work to be done.
(3) Compressing the gas isothermally or adiabatically will require the same amount of work.
(4) Which of the case (whether compression through isothermal or through adiabatic process) requires more work will depend upon the atomicity of the gas.
- 31.** A potentiometer wire is 100 cm long and a constant potential difference is maintained across it. Two cells are connected in series first to support one another and then in opposite direction. The balance points are obtained at 50 cm and 10 cm from the positive end of the wire in the two cases. The ratio of emf's is :-
- (1) 5 : 1 (2) 5 : 4
(3) 3 : 4 (4) 3 : 2
- 32.** A astronomical telescope has objective and eyepiece of focal lengths 40 cm and 4 cm respectively. To view an object 200 cm away from the objective, the lenses must be separated by a distance :-
- (1) 37.3 cm (2) 46.0 cm
(3) 50.0 cm (4) 54.0 cm

33. Two non-mixing liquids of densities ρ and $n\rho$ ($n > 1$) are put in a container. The height of each liquid is h . A solid cylinder of length L and density d is put in this container. The cylinder floats with its axis vertical and length pL ($p < 1$) in the denser liquid. The density d is equal to :-

(1) $\{1 + (n + 1)p\}\rho$ (2) $\{2 + (n + 1)p\}\rho$
 (3) $\{2 + (n - 1)p\}\rho$ (4) $\{1 + (n - 1)p\}\rho$

34. To get output 1 for the following circuit, the correct choice for the input is



- (1) $A = 0, B = 1, C = 0$
 (2) $A = 1, B = 0, C = 0$
 (3) $A = 1, B = 1, C = 0$
 (4) $A = 1, B = 0, C = 1$

35. A piece of ice falls from a height h so that it melts completely. Only one-quarter of the heat produced is absorbed by the ice and all energy of ice gets converted into heat during its fall. The value of h is :

[Latent heat of ice is 3.4×10^5 J/kg and $g = 10$ N/kg]

- (1) 34 km (2) 544 km
 (3) 136 km (4) 68 km

36. The ratio of escape velocity at earth (v_e) to the escape velocity at a planet (v_p) whose radius and mean density are twice as that of earth is :-

- (1) 1 : 2 (2) 1 : $2\sqrt{2}$
 (3) 1 : 4 (4) 1 : $\sqrt{2}$

37. If the magnitude of sum of two vectors is equal to the magnitude of difference of the two vectors, the angle between these vectors is :-

- (1) 0° (2) 90°
 (3) 45° (4) 180°

38. Given the value of Rydberg constant is 10^7m^{-1} , the wave number of the last line of the Balmer series in hydrogen spectrum will be :-

- (1) $0.025 \times 10^4 \text{m}^{-1}$ (2) $0.5 \times 10^7 \text{m}^{-1}$
 (3) $0.25 \times 10^7 \text{m}^{-1}$ (4) $2.5 \times 10^7 \text{m}^{-1}$

39. A body of mass 1 kg begins to move under the action of a time dependent force $\vec{F} = (2t\hat{i} + 3t^2\hat{j})\text{N}$, where \hat{i} and \hat{j} are unit vectors along x and y axis. What power will be developed by the force at the time t ?

- (1) $(2t^2 + 3t^3)\text{W}$ (2) $(2t^2 + 4t^4)\text{W}$
 (3) $(2t^3 + 3t^4)\text{W}$ (4) $(2t^3 + 3t^5)\text{W}$

40. An inductor 20 mH, a capacitor 50 μF and a resistor 40 Ω are connected in series across a source of emf $V = 10 \sin 340 t$. The power loss in A.C. circuit is:-

- (1) 0.51 W (2) 0.67 W
 (3) 0.76 W (4) 0.89 W

41. If the velocity of a particle is $v = At + Bt^2$, where A and B are constants, then the distance travelled by it between 1s and 2s is :-

- (1) $\frac{3}{2}A + 4B$ (2) $3A + 7B$
 (3) $\frac{3}{2}A + \frac{7}{3}B$ (4) $\frac{A}{2} + \frac{B}{3}$

42. A long solenoid has 1000 turns. When a current of 4A flows through it, the magnetic flux linked with each turn of the solenoid is 4×10^{-3} Wb. The self inductance of the solenoid is :-

- (1) 4H (2) 3H (3) 2H (4) 1H

43. A small signal voltage $V(t) = V_0 \sin \omega t$ is applied across an ideal capacitor C :-

- (1) Current $I(t)$, lags voltage $V(t)$ by 90° .
 (2) Over a full cycle the capacitor C does not consume any energy from the voltage source.
 (3) Current $I(t)$ is in phase with voltage $V(t)$.
 (4) Current $I(t)$ leads voltage $V(t)$ by 180° .

44. Match the corresponding entries of **column-1** with **column-2** (Where m is the magnification produced by the mirror) :-

Column-1

Column-2

- | | |
|------------------------|--------------------|
| (A) $m = -2$ | (a) Convex mirror |
| (B) $m = -\frac{1}{2}$ | (b) Concave mirror |
| (C) $m = +2$ | (c) Real image |
| (D) $m = +\frac{1}{2}$ | (d) Virtual image |

- (1) $A \rightarrow b$ and $c, B \rightarrow b$ and $c, C \rightarrow b$ and $d, D \rightarrow a$ and d .
 (2) $A \rightarrow a$ and $c, B \rightarrow a$ and $d, C \rightarrow a$ and $b, D \rightarrow c$ and d
 (3) $A \rightarrow a$ and $d, B \rightarrow b$ and $c, C \rightarrow b$ and $d, D \rightarrow b$ and c
 (4) $A \rightarrow c$ and $d, B \rightarrow b$ and $d, C \rightarrow b$ and $c, D \rightarrow a$ and d

45. A car is negotiating a curved road of radius R . The road is banked at an angle θ . the coefficient of friction between the tyres of the car and the road is μ_s . The maximum safe velocity on this road is:-

- (1) $\sqrt{gR^2 \frac{\mu_s + \tan \theta}{1 - \mu_s \tan \theta}}$ (2) $\sqrt{gR \frac{\mu_s + \tan \theta}{1 - \mu_s \tan \theta}}$
 (3) $\sqrt{\frac{g}{R} \frac{\mu_s + \tan \theta}{1 - \mu_s \tan \theta}}$ (4) $\sqrt{\frac{g}{R^2} \frac{\mu_s + \tan \theta}{1 - \mu_s \tan \theta}}$

46. Consider the molecules CH_4 , NH_3 and H_2O . Which of the given statements is false ?
- (1) The H–C–H bond angle in CH_4 , the H–N–H bond angle in NH_3 , and the H–O–H bond angle in H_2O are all greater than 90°
 - (2) The H–O–H bond angle in H_2O is larger than the H–C–H bond angle in CH_4 .
 - (3) The H–O–H bond angle in H_2O is smaller than the H–N–H bond angle in NH_3 .
 - (4) The H–C–H bond angle in CH_4 is larger than the H–N–H bond angle in NH_3 .
47. In the reaction
- $$\text{H}-\text{C}\equiv\text{CH} \xrightarrow[(2)\text{CH}_3\text{CH}_2\text{Br}]{(1)\text{NaNH}_2 / \text{liq.}\text{NH}_3} \text{X} \xrightarrow[(2)\text{CH}_3\text{CH}_2\text{Br}]{(1)\text{NaNH}_2 / \text{liq.}\text{NH}_3} \text{Y}$$
- X and Y are :
- (1) X = 1-Butyne ; Y = 3-Hexyne
 - (2) X = 2-Butyne ; Y = 3-Hexyne
 - (3) X = 2-Butyne ; Y = 2-Hexyne
 - (4) X = 1-Butyne ; Y = 2-Hexyne
48. Among the following, the correct order of acidity is
- (1) $\text{HClO}_3 < \text{HClO}_4 < \text{HClO}_2 < \text{HClO}$
 - (2) $\text{HClO} < \text{HClO}_2 < \text{HClO}_3 < \text{HClO}_4$
 - (3) $\text{HClO}_2 < \text{HClO} < \text{HClO}_3 < \text{HClO}_4$
 - (4) $\text{HClO}_4 < \text{HClO}_2 < \text{HClO} < \text{HClO}_3$
49. The rate of a first-order reaction is $0.04 \text{ mol L}^{-1}\text{s}^{-1}$ at 10 seconds and $0.03 \text{ mol L}^{-1}\text{s}^{-1}$ at 20 seconds after initiation of the reaction. The half-life period of the reaction is:
- (1) 24.1 s
 - (2) 34.1 s
 - (3) 44.1 s
 - (4) 54.1 s
50. Which one of the following characteristics is associated with adsorption ?
- (1) ΔG is negative but ΔH and ΔS are positive
 - (2) ΔG , ΔH and ΔS all are negative
 - (3) ΔG and ΔH are negative but ΔS is positive
 - (4) ΔG and ΔS are negative but ΔH is positive
51. In which of the following options the order of arrangement does not agree with the variation of property indicated against it ?
- (1) $\text{Al}^{3+} < \text{Mg}^{2+} < \text{Na}^+ < \text{F}^-$ (increasing ionic size)
 - (2) $\text{B} < \text{C} < \text{N} < \text{O}$ (increasing first ionisation enthalpy)
 - (3) $\text{I} < \text{Br} < \text{Cl} < \text{F}$ (increasing electron gain enthalpy)
 - (4) $\text{Li} < \text{Na} < \text{K} < \text{Rb}$ (increasing metallic radius)
52. Which of the following statements is false ?
- (1) Mg^{2+} ions form a complex with ATP
 - (2) Ca^{2+} ions are important in blood clotting
 - (3) Ca^{2+} ions are not important in maintaining the regular beating of the heart.
 - (4) Mg^{2+} ions are important in the green parts of plants.
53. Which of the following statements about hydrogen is **incorrect** ?
- (1) hydrogen has three isotopes of which tritium is the most common.
 - (2) Hydrogen never acts as cation in ionic salts
 - (3) Hydronium ion, H_3O^+ exists freely in solution
 - (4) Dihydrogen does not act as a reducing agent
54. The correct statement regarding a carbonyl compound with a hydrogen atom on its alpha carbon, is :-
- (1) A carbonyl compound with a hydrogen atom on its alpha-carbon never equilibrates with its corresponding enol.
 - (2) A carbonyl compound with a hydrogen atom on its alpha-carbon rapidly equilibrates with its corresponding enol and this process is known as aldehyde-ketone equilibration.
 - (3) A carbonyl compound with a hydrogen atom on its alpha-carbon rapidly equilibrates with its corresponding enol and this process is known as carbonylation.
 - (4) A carbonyl compound with a hydrogen atom on its alpha-carbon rapidly equilibrates with its corresponding enol and this process is known as keto-enol tautomerism.
55. MY and NY_3 , two nearly insoluble salts, have the same K_{sp} values of 6.2×10^{-13} at room temperature. Which statement would be **true** in regard to MY and NY_3 ?
- (1) The molar solubilities of MY and NY_3 in water are identical.
 - (2) The molar solubility of MY in water is less than that of NY_3
 - (3) The salts MY and NY_3 are more soluble in 0.5 M KY than in pure water.
 - (4) The addition of the salt of KY to solution of MY and NY_3 will have no effect on their solubilities.

56. In a protein molecule various amino acids are linked together by :

(1) α -glycosidic bond (2) β -glycosidic bond
(3) peptide bond (4) dative bond

57. Natural rubber has

(1) All cis-configuration
(2) All trans-configuration
(3) Alternate cis-and trans-configuration
(4) Random cis-and trans-configuration

58. Match items of **Column I** with the items of **Column II** and assign the correct code :

Column-I		Column-II	
(a)	Cyanide process	(i)	Ultrapure Ge
(b)	Froth floatation process	(ii)	Dressing of ZnS
(c)	Electrolytic reduction	(iii)	Extraction of Al
(d)	Zone refining	(iv)	Extraction of Au
		(v)	Purification of Ni

Code :

(a)	(b)	(c)	(d)
(1) (iv)	(ii)	(iii)	(i)
(2) (ii)	(iii)	(i)	(v)
(3) (i)	(ii)	(iii)	(iv)
(4) (iii)	(iv)	(v)	(i)

59. Which one of the following statements is correct when SO_2 is passed through acidified $\text{K}_2\text{Cr}_2\text{O}_7$ solution ?

(1) The solution turns blue
(2) The solution is decolourized
(3) SO_2 is reduced
(4) Green $\text{Cr}_2(\text{SO}_4)_3$ is formed

60. The electronic configurations of Eu (Atomic No 63), Gd (Atomic No 64) and Tb (Atomic No. 65) are

(1) $[\text{Xe}]4f^7 6s^2$, $[\text{Xe}]4f^8 6s^2$ and $[\text{Xe}]4f^8 5d^1 6s^2$
(2) $[\text{Xe}]4f^7 5d^1 6s^2$, $[\text{Xe}]4f^7 5d^1 6s^2$ and $[\text{Xe}]4f^9 6s^2$
(3) $[\text{Xe}]4f^6 5d^1 6s^2$, $[\text{Xe}]4f^7 5d^1 6s^2$ and $[\text{Xe}]4f^8 5d^1 6s^2$
(4) $[\text{Xe}]4f^7 6s^2$, $[\text{Xe}]4f^7 5d^1 6s^2$ and $[\text{Xe}]4f^9 6s^2$

61. Two electrons occupying the same orbital are distinguished by

(1) Principal quantum number
(2) Magnetic quantum number
(3) Azimuthal quantum number
(4) Spin quantum number

62. When copper is heated with conc. HNO_3 it produces

(1) $\text{Cu}(\text{NO}_3)_2$ and NO_2
(2) $\text{Cu}(\text{NO}_3)_2$ and NO
(3) $\text{Cu}(\text{NO}_3)_2$, NO and NO_2
(4) $\text{Cu}(\text{NO}_3)_2$ and N_2O

63. Which of the following reagents would distinguish cis-cyclopentane-1,2-diol from its trans-isomer?

(1) Acetone
(2) Ozone
(3) MnO_2
(4) Aluminium isopropoxide

64. The correct thermodynamic conditions for the spontaneous reaction at all temperatures is

(1) $\Delta H < 0$ and $\Delta S = 0$
(2) $\Delta H > 0$ and $\Delta S < 0$
(3) $\Delta H < 0$ and $\Delta S > 0$
(4) $\Delta H < 0$ and $\Delta S < 0$

65. Lithium has a bcc structure. Its density is 530 kg m^{-3} and its atomic mass is 6.94 g mol^{-1} . Calculate the edge length of a unit cell of Lithium metal.

($N_A = 6.02 \times 10^{23} \text{ mol}^{-1}$)

(1) 154 pm (2) 352 pm
(3) 527 pm (4) 264 pm

66. Which one of the following orders is correct for the bond dissociation enthalpy of halogen molecules?

(1) $\text{I}_2 > \text{Br}_2 > \text{Cl}_2 > \text{F}_2$
(2) $\text{Cl}_2 > \text{Br}_2 > \text{F}_2 > \text{I}_2$
(3) $\text{Br}_2 > \text{I}_2 > \text{F}_2 > \text{Cl}_2$
(4) $\text{F}_2 > \text{Cl}_2 > \text{Br}_2 > \text{I}_2$

67. Which of the following is an analgesic ?

(1) Novalgin
(2) Penicillin
(3) Streptomycin
(4) Chloromycetin

68. Equal moles of hydrogen and oxygen gases are placed in a container with a pin-hole through which both can escape. What fraction of the oxygen escapes in the time required for one-half of the hydrogen to escape ?

(1) $1/8$ (2) $1/4$
(3) $3/8$ (4) $1/2$

69. Consider the nitration of benzene using mixed conc. H_2SO_4 and HNO_3 . If a large amount of KHSO_4 is added to the mixture, the rate of nitration will be:-

- (1) faster (2) slower
(3) unchanged (4) doubled

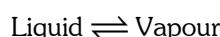
70. Predict the correct order among the following:-

- (1) lone pair - lone pair > lone pair - bond pair > bond pair - bond pair
(2) lone pair - lone pair > bond pair - bond pair > lone pair - bond pair
(3) bond pair - bond pair > lone pair - bond pair > lone pair - lone pair
(4) lone pair - bond pair > bond pair - bond pair > lone pair - lone pair

71. The product obtained as a result of a reaction of nitrogen with CaC_2 is :-

- (1) $\text{Ca}(\text{CN})_2$ (2) CaCN
(3) CaCN_3 (4) Ca_2CN

72. Consider the following liquid - vapour equilibrium.



Which of the following relations is **correct** ?

- (1) $\frac{d \ln G}{dT^2} = \frac{\Delta H_v}{RT^2}$ (2) $\frac{d \ln P}{dT} = \frac{-\Delta H_v}{RT}$
(3) $\frac{d \ln P}{dT^2} = \frac{-\Delta H_v}{T^2}$ (4) $\frac{d \ln P}{dT} = \frac{\Delta H_v}{RT^2}$

73. Match the compounds given in column I with the hybridisation and shape given in column II and mark the **correct** option.

Column-I		Column-II	
(a)	XeF_6	(i)	Distorted octahedral
(b)	XeO_3	(ii)	Square planar
(c)	XeOF_4	(iii)	pyramidal
(d)	XeF_4	(iv)	Square pyramidal

Code :-

- | (a) | (b) | (c) | (d) |
|----------|-------|------|-------|
| (1) (i) | (iii) | (iv) | (ii) |
| (2) (i) | (ii) | (iv) | (iii) |
| (3) (iv) | (iii) | (i) | (ii) |
| (4) (iv) | (i) | (ii) | (iii) |

74. Which of the following has longest C-O bond length? (Free C-O bond length in CO is 1.128 Å).

- (1) $\text{Ni}(\text{CO})_4$ (2) $[\text{Co}(\text{CO})_4]^\ominus$
(3) $[\text{Fe}(\text{CO})_4]^{2-}$ (4) $[\text{Mn}(\text{CO})_6]^+$

75. The pressure of H_2 required to make the potential of H_2 -electrode zero in pure water at 298 K is :-

- (1) 10^{-14} atm (2) 10^{-12} atm
(3) 10^{-10} atm (4) 10^{-4} atm

76. The addition of a catalyst during a chemical reaction alters which of the following quantities?

- (1) Entropy (2) Internal energy
(3) Enthalpy (4) Activation energy

77. The ionic radii of A^+ and B^- ions are $0.98 \times 10^{-10}\text{m}$ and $1.81 \times 10^{-10}\text{m}$. The coordination number of each ion in AB is :-

- (1) 6 (2) 4 (3) 8 (4) 2

78. Which is the **correct** statement for the given acids?

- (1) Phosphinic acid is a diprotic acid while phosphonic acid is a monoprotic acid
(2) Phosphinic acid is a monoprotic acid while phosphonic acid is a diprotic acid
(3) Both are triprotic acids
(4) Both are diprotic acids

79. Fog is colloidal solution of :-

- (1) Liquid in gas (2) Gas in liquid
(3) Solid in gas (4) Gas in gas

80. Which of the following statement about the composition of the vapour over an ideal 1 : 1 molar mixture of benzene and toluene is **correct**? Assume that the temperature is constant at 25°C.

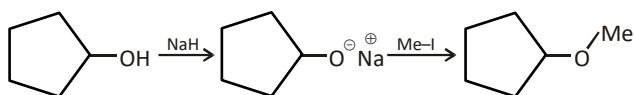
(Given : Vapour Pressure Data at 25°C, benzene = 12.8 kPa, Toluene = 3.85 kPa)

- (1) The vapour will contain a higher percentage of benzene
(2) The vapour will contain a higher percentage of toluene
(3) The vapour will contain equal amounts of benzene and toluene
(4) Not enough information is given to make a predication

81. The **correct** statement regarding the comparison of staggered and eclipsed conformation of ethane, is :-

- (1) The staggered conformation of ethane is less stable than eclipsed conformation, because staggered conformation has torsional strain
(2) The eclipsed conformation of ethane is more stable than staggered conformation, because eclipsed conformation has no torsional strain
(3) The eclipsed conformation of ethane is more stable than staggered conformation even through the eclipsed conformation has torsional strain
(4) The staggered conformation of ethane is more stable than eclipsed conformation, because staggered conformation has no torsional strain.

82. The reaction



Can be classified as :-

- (1) Williamson ether synthesis reaction
- (2) Alcohol formation reaction
- (3) Dehydration reaction
- (4) Williamson alcohol synthesis reaction

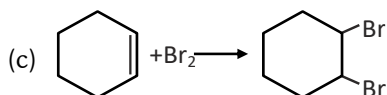
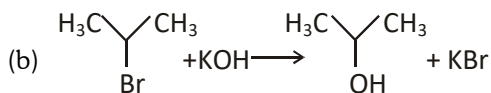
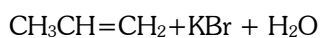
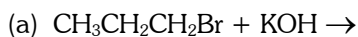
83. The product formed by the reaction of an aldehyde with a primary amine is :-

- (1) Schiff base
- (2) Ketone
- (3) Carboxylic acid
- (4) Aromatic acid

84. Which of the following biphenyls is optically active?

- (1)
- (2)
- (3)
- (4)

85. For the following reactions :-



Which of the following statement is **correct**?

- (1) (a) and (b) are elimination reaction and (c) is addition reaction
- (2) (a) is elimination, (b) is substitution and (c) is addition reaction
- (3) (a) is elimination, (b) and (c) are substitution reactions
- (4) (a) is substitution, (b) and (c) are addition reaction

86. At 100°C the vapour pressure of a solution of 6.5g of a solute in 100 g water is 732 mm. If $K_b = 0.52$, the boiling point of this solution will be :

- (1) 101°C
- (2) 100°C
- (3) 102°C
- (4) 103°C

87. The **correct** statement regarding RNA and DNA, respectively is :

- (1) The sugar component in RNA is arabinose and the sugar component in DNA is 2'-deoxyribose.
- (2) The sugar component in RNA is ribose and the sugar component in DNA is 2'-deoxyribose.
- (3) The sugar component in RNA is arabinose
- (4) The sugar component in RNA is 2'-deoxyribose and the sugar component in DNA is arabinose.

88. The **correct** statement regarding the basicity of arylamines is :-

- (1) Arylamines are generally less basic than alkylamines because the nitrogen lone-pair electrons are delocalized by interaction with the aromatic ring π electron system.
- (2) Arylamines are generally more basic than alkylamines because the nitrogen lone-pair electrons are not delocalized by interaction with the aromatic ring π electron system.
- (3) Arylamines are generally more basic than alkylamines because of aryl group.
- (4) Arylamines are generally more basic than alkylamines, because the nitrogen atom in arylamines is sp -hybridized.

89. Which one given below is a non-reducing sugar?

- (1) Maltose
- (2) Lactose
- (3) Glucose
- (4) Sucrose

90. The pair of electron in the given carbanion, $\text{CH}_3\text{C}\equiv\text{C}^\ominus$, is present in which of the following orbitals ?

- (1) $2p$
- (2) sp^3
- (3) sp^2
- (4) sp

91. Gause's principle of competitive exclusion states that :
- (1) More abundant species will exclude the less abundant species through competition.
 - (2) Competition for the same resources excludes species having different food preferences.
 - (3) No two species can occupy the same niche indefinitely for the same limiting resources.
 - (4) Larger organisms exclude smaller ones through competition.
92. The two polypeptides of human insulin are linked together by :-
- (1) Hydrogen bonds
 - (2) Phosphodiester bond
 - (3) Covalent bond
 - (4) Disulphide bridges
93. The coconut water from tender coconut represents:-
- (1) Endocarp
 - (2) Fleshy mesocarp
 - (3) Free nuclear proembryo
 - (4) Free nuclear endosperm
94. Which of the following statements is **wrong** for viroids?
- (1) They lack a protein coat
 - (2) They are smaller than viruses
 - (3) They cause infections
 - (4) Their RNA is of high molecular weight
95. Which of the following features is **not** present in the Phylum - Arthropoda ?
- (1) Chitinous exoskeleton
 - (2) Metameric segmentation
 - (3) Parapodia
 - (4) Jointed appendages
96. Which of the following most appropriately describes haemophilia ?
- (1) Recessive gene disorder
 - (2) X - linked recessive gene disorder
 - (3) Chromosomal disorder
 - (4) Dominant gene disorder
97. Emerson's enhancement effect and Red drop have been instrumental in the discovery of :-
- (1) Photophosphorylation and non-cyclic electron transport
 - (2) Two photosystems operating simultaneously
 - (3) Photophosphorylation and cyclic electron transport
 - (4) Oxidative phosphorylation
98. In which of the following, all three are macronutrients?
- (1) Boron, zinc, manganese
 - (2) Iron, copper, molybdenum
 - (3) Molybdenum, magnesium, manganese
 - (4) Nitrogen, nickel, phosphorus
99. Name the chronic respiratory disorder caused mainly by cigarette smoking :-
- (1) Emphysema
 - (2) Asthma
 - (3) Respiratory acidosis
 - (4) Respiratory alkalosis
100. A system of rotating crops with legume or grass pasture to improve soil structure and fertility is called:-
- (1) Ley farming
 - (2) Contour farming
 - (3) Strip farming
 - (4) Shifting agriculture
101. Mitochondria and chloroplast are :-
- (a) semi-autonomous organelles
 - (b) formed by division of pre-existing organelles and they contain DNA but lack protein synthesizing machinery
- Which one of the following options is **correct**?
- (1) Both (a) and (b) are correct
 - (2) (b) is true but (a) is false
 - (3) (a) is true but (b) is false
 - (4) Both (a) and (b) are false
102. In context of Amniocentesis, which of the following statement is **incorrect** ?
- (1) It is usually done when a woman is between 14-16 weeks pregnant.
 - (2) It is used for prenatal sex determination
 - (3) It can be used for detection of Down syndrome
 - (4) It can be used for detection of Cleft palate

- 103.** In a chloroplast the highest number of protons are found in :-
 (1) Stroma
 (2) Lumen of thylakoids
 (3) Inter membrane space
 (4) Antennae complex
- 104.** Photosensitive compound in human eye is made up of :-
 (1) Guanosine and Retinol
 (2) Opsin and Retinal
 (3) Opsin and Retinol
 (4) Transducin and Retinene
- 105.** Spindle fibres attach on to :-
 (1) Telomere of the chromosome
 (2) Kinetochore of the chromosome
 (3) Centromere of the chromosome
 (4) Kinetosome of the chromosome
- 106.** Which is the National Aquatic Animal of India ?
 (1) Gangetic shark
 (2) River dolphin
 (3) Blue whale
 (4) Sea-horse
- 107.** Which of the following is required as inducer(s) for the expression of Lac operon?
 (1) Glucose
 (2) Galactose
 (3) Lactose
 (4) Lactose and galactose
- 108.** Which of the following pairs of hormones are **not** antagonistic (having opposite effects) to each other?
 (1) Parathormone – Calcitonin
 (2) Insulin – Glucagon
 (3) Aldosterone – Atrial Natriuretic Factor
 (4) Relaxin – Inhibin
- 109.** Microtubules are the constituents of :-
 (1) Cilia, Flagella and Peroxisomes
 (2) Spindle fibres, Centrioles and Cilia
 (3) Centrioles, Spindle fibres and Chromatin
 (4) Centrosome, Nucleosome and Centrioles
- 110.** A complex of ribosomes attached to a single strand of RNA is known as :-
 (1) Polysome
 (2) Polymer
 (3) Polypeptide
 (4) Okazaki fragment
- 111.** Fertilization in humans is practically feasible only if:-
 (1) the sperms are transported into vagina just after the release of ovum in fallopian tube
 (2) the ovum and sperms are transported simultaneously to ampullary isthmic junction of the fallopian tube
 (3) the ovum and sperms are transported simultaneously to ampullary - isthmic junction of the cervix
 (4) the sperms are transported into cervix within 48 hrs of release of ovum in uterus
- 112.** Asthma may be attributed to :
 (1) bacterial infection of the lungs
 (2) allergic reaction of the mast cells in the lungs
 (3) inflammation of the trachea
 (4) accumulation of fluid in the lungs
- 113.** The *Avena* curvature is used for bioassay of:
 (1) ABA (2) GA₃
 (3) IAA (4) Ethylene
- 114.** The standard petal of a papilionaceous corolla is also called :
 (1) Carina (2) Pappus
 (3) Vexillum (4) Corona
- 115.** Tricarpellary syncarpous gynoecium is found in flowers of :
 (1) Liliaceae (2) Solanaceae
 (3) Fabaceae (4) Poaceae
- 116.** One of the major components of cell wall of most fungi is :-
 (1) Chitin (2) Peptidoglycan
 (3) Cellulose (4) Hemicellulose

117. Select the incorrect statement :

- (1) FSH stimulates the sertoli cells which help in spermiogenesis
- (2) LH triggers ovulation in ovary
- (3) LH and FSH decrease gradually during the follicular phase
- (4) LH triggers secretion of androgens from the Leydig cells

118. In meiosis crossing over is initiated at :

- (1) Pachytene
- (2) Leptotene
- (3) Zygotene
- (4) Diplotene

119. A tall true breeding garden pea plant is crossed with a dwarf true breeding garden pea plant. When the F_1 plants were selfed the resulting genotypes were in the ratio of :

- (1) 1 : 2 : 1 :: Tall homozygous : Tall heterozygous : Dwarf
- (2) 1 : 2 : 1 :: Tall heterozygous : Tall homozygous : Dwarf
- (3) 3 : 1 :: Tall : Dwarf
- (4) 3 : 1 :: Dwarf : Tall

120. Which of the following is the most important cause of animals and plants being driven to extinction ?

- (1) Over - exploitation
- (2) Alien species invasion
- (3) Habitat loss and fragmentation
- (4) Co-extinctions

121. Which of the following is a characteristic feature of cropland ecosystem ?

- (1) Absence of soil organisms
- (2) Least genetic diversity
- (3) Absence of weeds
- (4) Ecological succession

122. Changes in GnRH pulse frequency in females is controlled by circulating levels of:-

- (1) estrogen and progesterone
- (2) estrogen and inhibin
- (3) progesterone only
- (4) progesterone and inhibin

123. Which of the following is not a feature of the plasmids?

- (1) Independent replication
- (2) Circular structure
- (3) Transferable
- (4) Single - stranded

124. Which of the following features is not present in *Periplaneta americana* ?

- (1) Schizocoelom as body cavity
- (2) Indeterminate and radial cleavage during embryonic development
- (3) Exoskeleton composed of N-acetylglucosamine
- (4) Metamerically segmented body

125. In higher vertebrates, the immune system can distinguish self-cells and non-self. If this property is lost due to genetic abnormality and it attacks self-cells, then it leads to :-

- (1) Allergic response
- (2) Graft rejection
- (3) Auto-immune disease
- (4) Active immunity

126. Match the terms in Column-I with their description in Column-II and choose the correct option :

Column-I		Column-II	
(a)	Dominance	(i)	Many genes govern a single character
(b)	Codominance	(ii)	In a heterozygous organism only one allele expresses itself
(c)	Pleiotropy	(iii)	In a heterozygous organism both alleles express themselves fully
(d)	Polygenic inheritance	(iv)	A single gene influences many characters

- | | | | |
|----------|-------|------|-------|
| (a) | (b) | (c) | (d) |
| (1) (ii) | (i) | (iv) | (iii) |
| (2) (ii) | (iii) | (iv) | (i) |
| (3) (iv) | (i) | (ii) | (iii) |
| (4) (iv) | (iii) | (i) | (ii) |

127. Joint Forest Management Concept was introduced in India during :

- (1) 1960 s (2) 1970 s
(3) 1980 s (4) 1990 s

128. Pick out the correct statements :

- (a) Haemophilia is a sex-linked recessive disease
(b) Down's syndrome is due to aneuploidy
(c) Phenylketonuria is an autosomal recessive gene disorder.
(d) Sickle cell anaemia is a X-linked recessive gene disorder

- (1) (a) and (d) are correct
(2) (b) and (d) are correct
(3) (a), (c) and (d) are correct
(4) (a), (b) and (c) are correct

129. Which one of the following statements is wrong?

- (1) Cyanobacteria are also called blue-green algae
(2) Golden algae are also called desmids
(3) Eubacteria are also called false bacteria
(4) Phycomycetes are also called algal fungi

130. Proximal end of the filament of stamen is attached to the

- (1) Anther (2) Connective
(3) Placenta (4) Thalamus or petal

131. Which of the following approaches does **not** give the defined action of contraceptive?

(1)	Barrier methods	prevent fertilization
(2)	Intra uterine devices	Increase phagocytosis of sperms, suppress sperm motility and fertilizing capacity of sperms
(3)	Hormonal contraceptives	Prevent/retard entry of sperms, prevent ovulation and fertilization
(4)	Vasectomy	Prevents spermatogenesis

132. The taq polymerase enzyme is obtained from:

- (1) *Thermus aquaticus*
(2) *Thiobacillus ferrooxidans*
(3) *Bacillus subtilis*
(4) *Pseudomonas putida*

133. Identify the **correct** statement on 'inhibin':-

- (1) Inhibits the secretion of LH, FSH and Prolactin.
(2) Is produced by granulosa cells in ovary and inhibits the secretion of FSH.
(3) Is produced by granulosa cells in ovary and inhibits the secretion of LH.
(4) Is produced by nurse cells in testes and inhibits the secretion of LH.

134. Which part of the tobacco plant is infected by *Meloidogyne incognita* ?

- (1) Flower (2) Leaf (3) Stem (4) Root

135. Antivenom injection contains preformed antibodies while polio drops that are administered into the body contain :-

- (1) Activated pathogens
(2) Harvested antibodies
(3) Gamma globulin
(4) Attenuated pathogens

136. Which one of the following cell organelles is enclosed by a single membrane ?

- (1) Mitochondria (2) Chloroplasts
(3) Lysosomes (4) Nuclei

137. Lack of relaxation between successive stimuli in sustained muscle contraction is known as :-

- (1) Spasm (2) Fatigue
(3) Tetanus (4) Tonus

138. Which of the following is **not** a stem modification?

- (1) Pitcher of *Nepenthes*
(2) Thorns of citrus
(3) Tendrils of cucumber
(4) Flattened structures of *Opuntia*

139. Water soluble pigments found in plant cell vacuoles are :-

- (1) Xanthophylls (2) Chlorophylls
(3) Carotenoids (4) Anthocyanins

140. Select the **correct** statement :-

- (1) Gymnosperms are both homosporous and heterosporous
(2) *Salvinia*, *Ginkgo* and *Pinus* all are gymnosperms
(3) Sequoia is one of the tallest trees
(4) The leaves of gymnosperms are not well adapted to extremes of climate

141. Which of the following is **not** required for any of the techniques of DNA fingerprinting available at present ?

- (1) Polymerase chain reaction
(2) Zinc finger analysis
(3) Restriction enzymes
(4) DNA-DNA hybridization

142. Which type of tissue correctly matches with its location ?

Tissue	Location
(1) Smooth muscle	Wall of intestine
(2) Areolar tissue	Tendons
(3) Transitional epithelium	Tip nose
(4) Cuboidal epithelium	Lining of stomach

143. A plant in your garden avoids photorespiratory losses, has improved water use efficiency shows high rates of photosynthesis at high temperatures and has improved efficiency of nitrogen utilisation. In which of the following physiological groups would you assign this plant?

- (1) C₃ (2) C₄
(3) CAM (4) Nitrogen fixer

144. Which of the following structures is homologous to the wing of a bird ?

- (1) Dorsal fin of a Shark
(2) Wing of a Moth
(3) Hind limb of Rabbit
(4) Flipper of Whale

145. Which of the following characteristic features always holds true for the corresponding group of animals?

(1)	Cartilaginous endoskeleton	Chondrichthyes
(2)	Viviparous	Mammalia
(3)	Possess a mouth with an upper and a lower jaw	Chordata
(4)	3 - chambered heart with one incompletely divided ventricle	Reptilia

146. Which of the following statements is **not true** for cancer cells in relation to mutations ?

- (1) Mutations in proto-oncogenes accelerate the cell cycle.
(2) Mutations destroy telomerase inhibitor.
(3) Mutations inactive the cell control.
(4) Mutations inhibit production of telomerase.

147. The amino acid Tryptophan is the precursor for the synthesis of :-

- (1) Melatonin and Serotonin
(2) Thyroxine and Triiodothyronine
(3) Estrogen and Progesterone
(4) Cortisol and Cortisone

148. Following are the two statements regarding the origin of life :-

- (a) The earliest organisms that appeared on the earth were non-green and presumably anaerobes.
(b) The first autotrophic organisms were the chemoautotrophs that never released oxygen.
Of the above statements which one of the following options is **correct** ?

- (1) (a) is correct but (b) is false.
(2) (b) is correct but (a) is false.
(3) Both (a) and (b) are correct.
(4) Both (a) and (b) are false.

149. Reduction in pH of blood will :-

- (1) reduce the rate of heart beat.
(2) reduce the blood supply to the brain.
(3) decrease the affinity of hemoglobin with oxygen.
(4) release bicarbonate ions by the liver.

150. Analogous structures are a result of :-

- (1) Divergent evolution
(2) Convergent evolution
(3) Shared ancestry
(4) Stabilizing selection

151. Which of the following is a restriction endonuclease?

- (1) Hind II (2) Protease
(3) DNase I (4) RNase

152. The term ecosystem was coined by :-

- (1) E.P. Odum (2) A.G. Tansley
(3) E. Haeckel (4) E. Warming

153. Which one of the following statements is **wrong**?

- (1) Sucrose is a disaccharide.
(2) Cellulose is a polysaccharide.
(3) Uracil is a pyrimidine.
(4) Glycine is a sulphur containing amino acid.

154. In bryophytes and pteridophytes, transport of male gametes requires :-

- (1) Wind (2) Insects (3) Birds (4) Water

155. When does the growth rate of a population following the logistic model equal zero ? The logistic model is given as $dN/dt = rN(1-N/K)$:-

- (1) when N/K is exactly one.
(2) when N nears the carrying capacity of the habitat.
(3) when N/K equals zero.
(4) when death rate is greater than birth rate.

- 156.** Which one of the following statements is **not** true?
 (1) Tapetum helps in the dehiscence of anther
 (2) Exine of pollen grains is made up of sporopollenin
 (3) Pollen grains of many species cause severe allergies
 (4) Stored pollen in liquid nitrogen can be used in the crop breeding programmes
- 157.** Which of the following would appear as the pioneer organisms on bare rocks?
 (1) Lichens (2) Liverworts
 (3) Mosses (4) Green algae
- 158.** Which one of the following is the starter codon?
 (1) AUG (2) UGA
 (3) UAA (4) UAG
- 159.** Which one of the following characteristics is **not** shared by birds and mammals ?
 (1) Ossified endoskeleton
 (2) Breathing using lungs
 (3) Viviparity
 (4) Warm blooded nature
- 160.** Nomenclature is governed by certain universal rules. Which one of the following is contrary to the rules of nomenclature?
 (1) Biological names can be written in any language
 (2) The first word in a biological name represents the genus name, and the second is a specific epithet
 (3) The names are written in Latin and are italicised
 (4) When written by hand, the names are to be underlined
- 161.** Blood pressure in the pulmonary artery is :-
 (1) same as that in the aorta.
 (2) more than that in the carotid.
 (3) more than that in the pulmonary vein.
 (4) less than that in the venae cavae.
- 162.** Cotyledon of maize grain is called :-
 (1) plumule (2) coleorhiza
 (3) coleoptile (4) scutellum
- 163.** In the stomach, gastric acid is secreted by the :-
 (1) gastrin secreting cells
 (2) parietal cells
 (3) peptic cells
 (4) acidic cells
- 164.** Depletion of which gas in the atmosphere can lead to an increased incidence of skin cancers :-
 (1) Nitrous oxide (2) Ozone
 (3) Ammonia (4) Methane
- 165.** Chrysophytes, Euglenoids, Dinoflagellates and Slime moulds are included in the kingdom :-
 (1) Monera (2) Protista
 (3) Fungi (4) Animalia
- 166.** Water vapour comes out from the plant leaf through the stomatal opening. Through the same stomatal opening carbon dioxide diffuses into the plant during photosynthesis. Reason out the above statements using one of following options:-
 (1) Both processes cannot happen simultaneously.
 (2) Both processes can happen together because the diffusion coefficient of water and CO₂ is different.
 (3) The above processes happen only during night time.
 (4) One process occurs during day time, and the other at night.
- 167.** In mammals, which blood vessel would normally carry largest amount of urea ?
 (1) Renal Vein (2) Dorsal Aorta
 (3) Hepatic Vein (4) Hepatic Portal Vein
- 168.** Seed formation without fertilization in flowering plants involves the process of :-
 (1) Sporulation
 (2) Budding
 (3) Somatic hybridization
 (4) Apomixis
- 169.** Which of the following is wrongly matched in the given table?
- | | Microbe | Product | Application |
|-----|-------------------------------|---------------|-----------------------------------|
| (1) | <i>Trichoderma polysporum</i> | Cyclosporin A | immunosuppressive drug |
| (2) | <i>Monascus purpureus</i> | Statins | lowering of blood cholesterol |
| (3) | <i>Streptococcus</i> | Streptokinase | removal of clot from blood vessel |
| (4) | <i>Clostridium butylicum</i> | Lipase | removal of oil stains |

- 170.** In a testcross involving F_1 dihybrid flies, more parental-type offspring were produced than the recombinant-type offspring. This indicates :-
- (1) The two genes are located on two different chromosomes.
 - (2) Chromosomes failed to separate during meiosis.
 - (3) The two genes are linked and present on the same chromosome.
 - (4) Both of the characters are controlled by more than one gene.
- 171.** It is much easier for a small animal to run uphill than for a large animal, because :-
- (1) It is easier to carry a small body weight.
 - (2) Smaller animals have a higher metabolic rate.
 - (3) Small animals have a lower O_2 requirement.
 - (4) The efficiency of muscles in large animals is less than in the small animals.
- 172.** Which of the following is **not** a characteristic feature during mitosis in somatic cells ?
- (1) Spindle fibres
 - (2) Disappearance of nucleolus
 - (3) Chromosome movement
 - (4) Synapsis
- 173.** Which of the following statements is **not** correct?
- (1) Pollen grains of many species can germinate on the stigma of a flower, but only one pollen tube of the same species grows into the style.
 - (2) Insects that consume pollen or nectar without bringing about pollination are called pollen/nectar robbers.
 - (3) Pollen germination and pollen tube growth are regulated by chemical components of pollen interacting with those of the pistil.
 - (4) Some reptiles have also been reported as pollinators in some plant species.
- 174.** Specialised epidermal cells surrounding the guard cells are called :-
- (1) Complementary cells
 - (2) Subsidiary cells
 - (3) Bulliform cells
 - (4) Lenticels
- 175.** Which of the following guards the opening of hepatopancreatic duct into the duodenum?
- (1) Semilunar valve
 - (2) Ileocaecal valve
 - (3) Pyloric sphincter
 - (4) Sphincter of Oddi
- 176.** Stems modified into flat green organs performing the functions of leaves are known as :-
- (1) Cladodes
 - (2) Phyllodes
 - (3) Phylloclades
 - (4) Scales
- 177.** The primitive prokaryotes responsible for the production of biogas from the dung of ruminant animals, include the :-
- (1) Halophiles
 - (2) Thermoacidophiles
 - (3) Methanogens
 - (4) Eubacteria
- 178.** A river with an inflow of domestic sewage rich in organic waste may result in :-
- (1) Drying of the river very soon due to algal bloom.
 - (2) Increased population of aquatic food web organisms.
 - (3) An increased production of fish due to biodegradable nutrients.
 - (4) Death of fish due to lack of oxygen.
- 179.** A cell at telophase stage is observed by a student in a plant brought from the field. He tells his teacher that this cell is not like other cells at telophase stage. There is no formation of cell plate and thus the cell is containing more number of chromosomes as compared to other dividing cells. This would result in :-
- (1) Aneuploidy
 - (2) Polyploidy
 - (3) Somaclonal variation
 - (4) Polyteny
- 180.** A typical fat molecule is made up of :-
- (1) Three glycerol molecules and one fatty acid molecule
 - (2) One glycerol and three fatty acid molecules
 - (3) One glycerol and one fatty acid molecule
 - (4) Three glycerol and three fatty acid molecules

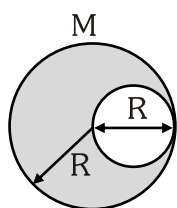
ANSWER KEY

NEET(I)-2016

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	2	1	1	3	4	4	1	4	3	2	3	3	2	1	4
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	4	1	4	1	1	2	2	1	1	2	3	3	4	4	2
Que.	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Ans.	4	4	4	4	3	2	2	3	4	1	3	4	2	1	2
Que.	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ans.	2	1	2	1	2	2,3	3	1,4	4	2	3	1	1	4	4
Que.	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Ans.	4	1	1	3	2	2	1	1	2	1	B	4	1	3	1
Que.	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
Ans.	4	1	2	1	1	4	1	1	2	2	1	2	1	4	4
Que.	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105
Ans.	3	4	4	4	3	2	2	B	1	1	3	4	2	2	2
Que.	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
Ans.	2	3	4	2	1	2	2	3	3	1	1	3	1	1	3
Que.	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135
Ans.	2	1	4	2	3	2	3	4	3	4	4	1	2	4	4
Que.	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
Ans.	3	3	1	4	3	2	1	2	4	1	4	1	3	3	2
Que.	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165
Ans.	1	2	4	4	1	1	1	1	3	1	3	4	2	2	2
Que.	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
Ans.	2	3	4	4	3	2	4	1	2	4	3	3	4	2	2

HINT - SHEET

1.



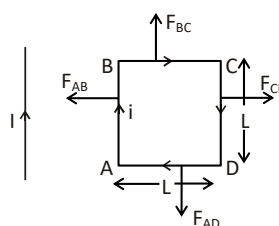
$$I_{\text{Total disc}} = \frac{MR^2}{2}$$

$$M_{\text{Removed}} = \frac{M}{4} \quad (\because \text{Mass} \propto \text{area})$$

$$I_{\text{Removed}} \text{ (about same Perpendicular axis)} \\ = \frac{M}{4} \frac{(R/2)^2}{2} + \frac{M}{4} \left(\frac{R}{2}\right)^2 = \frac{3MR^2}{32}$$

$$I_{\text{Remaining disc}} = I_{\text{Total}} - I_{\text{Removed}} \\ = \frac{MR^2}{2} - \frac{3}{32}MR^2 = \frac{13}{32}MR^2$$

2.



$$F_{AB} = i\ell B \text{ (Attractive)}$$

$$F_{AB} = i(L) \cdot \frac{\mu_0 I}{2\pi \left(\frac{L}{2}\right)} (\leftarrow) = \frac{\mu_0 iI}{\pi} (\leftarrow)$$

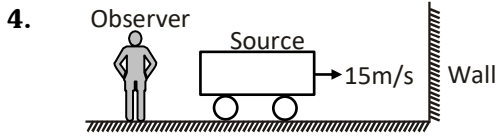
$$F_{BC} (\uparrow) \text{ and } F_{AD} (\downarrow) \Rightarrow \text{cancels each other}$$

$$F_{CD} = i\ell B \text{ (Repulsive)}$$

$$F_{CD} = i(L) \cdot \frac{\mu_0 I}{2\pi \left(\frac{3L}{2}\right)} (\rightarrow) = \frac{\mu_0 iI}{3\pi} (\rightarrow)$$

$$\Rightarrow F_{\text{net}} = \frac{\mu_0 iI}{\pi} - \frac{\mu_0 iI}{3\pi} = \frac{2\mu_0 iI}{3\pi}$$

3. Magnetic susceptibility = χ
It is negative for diamagnetic materials only



frequency at wall is n'

$$n' = \frac{v}{v - v_s} n_0$$

$$n' = \frac{330}{330 - 15} (800) = \frac{330 \times 800}{315} = 838 \text{ Hz}$$

Since the observer and wall are stationary so frequency of echo heard by observer will also be 838 Hz.

5. Initial energy stored in capacitor 2 μF

$$U_i = \frac{1}{2} 2(V)^2 = V^2$$

Final voltage after switch 2 is ON

$$V_f = \frac{C_1 V_1}{C_1 + C_2} = \frac{2V}{10} = 0.2V$$

Final energy in both the capacitors

$$U_f = \frac{1}{2} (C_1 + C_2) V_f^2 = \frac{1}{2} 10 \left(\frac{2V}{10} \right)^2 = 0.2V^2$$

$$\text{So energy dissipated} = \frac{V^2 - 0.2V^2}{V^2} \times 100 = 80\%$$

6. For first minima, $\sin 30^\circ = \frac{\lambda}{a} = \frac{1}{2}$

First secondary maxima will be at

$$\sin \theta = \frac{3\lambda}{2a} = \frac{3}{2} \left(\frac{1}{2} \right) \Rightarrow \theta = \sin^{-1} \left(\frac{3}{4} \right)$$

7. $V = \frac{-GM}{R+h} = -5.4 \times 10^7$ (1)

$$\text{and } g = \frac{GM}{(R+h)^2} = 6$$
 (2)

dividing (1) and (2)

$$\Rightarrow \frac{5.4 \times 10^7}{(R+h)} = 6$$

$$\Rightarrow R + h = 9000 \text{ km so } h = 2600 \text{ km}$$

8. To generate electromagnetic waves we need accelerating charge particle.

9. Here, we have to assume that ball is moving very slowly

$$\tan \theta = \frac{F_e}{mg} = \theta$$

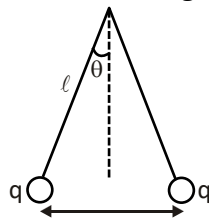
$$\Rightarrow \frac{Kq^2}{x^2 mg} = \frac{x}{2\ell}$$

$$\Rightarrow x^3 \propto q^2$$

differentiating above equation w.r.t. time

$$3x^2 \frac{dx}{dt} \propto 2q \frac{dq}{dt} \text{ but } \frac{dq}{dt} \text{ is constant}$$

$$\text{so } x^2(v) \propto q \Rightarrow \boxed{v \propto x^{-1/2}}$$



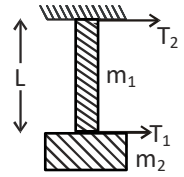
10. $T_1 = m_2 g$

$$T_2 = (m_1 + m_2)g$$

$$\text{Velocity} \propto \sqrt{T}$$

$$\Rightarrow \lambda \propto \sqrt{T}$$

$$\Rightarrow \frac{\lambda_1}{\lambda_2} = \frac{\sqrt{T_1}}{\sqrt{T_2}} \Rightarrow \frac{\lambda_2}{\lambda_1} = \sqrt{\frac{m_1 + m_2}{m_2}}$$



11. $\beta = \frac{Q_2}{W} = \frac{T_2}{T_1 - T_2}$ (Where Q_2 is heat removed)

$$\Rightarrow \frac{600 \times 4.2}{W} = \frac{277}{303 - 277}$$

$$\Rightarrow W = 236.5 \text{ joule}$$

$$\Rightarrow \text{Power} = \frac{W}{t} = \frac{236.5 \text{ joule}}{1 \text{ sec}} = 236.5 \text{ watt.}$$

12. First minimum resonating length for closed organ

$$\text{pipe} = \frac{\lambda}{4} = 50 \text{ cm}$$

\therefore Next larger length of air column

$$= \frac{3\lambda}{4} = 150 \text{ cm}$$

13. Since diode is in forward bias

$$i = \frac{\Delta V}{R} = \frac{4 - (-6)}{1 \times 10^3} = \frac{10}{10^3} = 10^{-2} \text{ A}$$

14. $Q = at - bt^2 \Rightarrow i = \frac{dQ}{dt} = a - 2bt$

$$\{ \text{for } i = 0 \Rightarrow t = \frac{a}{2b} \}$$

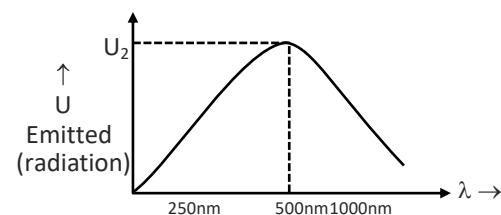
From joule's law of heating $dH = i^2 R dt$

$$\Rightarrow H = \int_0^{a/2b} (a - 2bt)^2 R dt$$

$$\Rightarrow H = \frac{(a - 2bt)^3 R}{-3 \times 2b} \bigg|_0^{a/2b} = \frac{a^3 R}{6b}$$

15. Maximum amount of emitted radiation corresponding to $\lambda_m = \frac{b}{T}$

$$\lambda_m = \frac{2.88 \times 10^6 \text{ nmK}}{5760 \text{ K}} = 500 \text{ nm}$$



From the graph $U_1 < U_2 > U_3$

16. Change in length for both rods should be same

$$\Delta l_1 = \Delta l_2 \Rightarrow l_1 \alpha_1 \Delta T = l_2 \alpha_2 \Delta T \Rightarrow l_1 \alpha_1 = l_2 \alpha_2$$

17. $\beta = \frac{\alpha}{1-\alpha} = \frac{0.96}{0.04} = 24$

Voltage gain for common base configuration

$$A_v = \alpha \left(\frac{R_L}{R_p} \right) = 0.96 \times \left(\frac{800}{192} \right) = 4$$

Power gain for common base configuration

$$P_v = A_v \alpha = 4 \times 0.96 = 3.84$$

Voltage gain for common emitter configuration

$$A_v = \beta \left(\frac{R_L}{R_i} \right) = 24 \times \left(\frac{800}{192} \right) = 100$$

Power gain for common emitter configuration

$$P_v = \beta A_v = 24 \times 100 = 2400$$

***In the question it is asked about common emitter configuration but we got above answer for common base configuration.**

18. Path difference

$$= S_2P - S_1P$$

$$= \sqrt{D^2 + d^2} - D$$

$$= D \left(1 + \frac{1}{2} \frac{d^2}{D^2} \right) - D$$

$$= D \left[1 + \frac{d^2}{2D^2} - 1 \right] = \frac{d^2}{2D}$$

$$\Delta x = \frac{d^2}{2 \times 10d} = \frac{d}{20} = \frac{5\lambda}{20} = \frac{\lambda}{4}$$

$$\Delta \phi = \frac{2\pi}{\lambda} \cdot \frac{\lambda}{4} = \frac{\pi}{2}$$

So, intensity at the desired point is

$$I = I_0 \cos^2 \frac{\phi}{2} = I_0 \cos^2 \frac{\pi}{4} = \frac{I_0}{2}$$

19. Particle at periphery will have both radial and tangential acceleration

$$a_t = R\alpha = 0.5 \times 2 = 1 \text{ m/s}^2$$

$$\omega = \omega_0 + \alpha t = 0 + 2 \times 2 = 4 \text{ rad/sec}$$

$$a_c = \omega^2 R = (4)^2 \times 0.5 = 16 \times 0.5 = 8 \text{ m/s}^2$$

$$a_{\text{total}} = \sqrt{a_p^2 + a_c^2} = \sqrt{1^2 + 8^2} \approx 8 \text{ m/s}^2$$

***In this question we have assumed the point to be located at periphery of the disc.**

20. For electron $\lambda_e = \frac{h}{\sqrt{2mE}}$

for Photon $E = pc$

$$\Rightarrow \lambda_{\text{ph}} = \frac{hc}{E}$$

$$\Rightarrow \frac{\lambda_e}{\lambda_{\text{ph}}} = \frac{h}{\sqrt{2mE}} \times \frac{E}{hc} = \left(\frac{E}{2m} \right)^{1/2} \frac{1}{c}$$

21. acceleration = $\frac{g \sin \theta}{1 + \frac{K^2}{R^2}}$

for disc ; $\frac{K^2}{R^2} = \frac{1}{2} = 0.5$

for sphere ; $\frac{K^2}{R^2} = \frac{2}{5} = 0.4$

$$\Rightarrow a_{(\text{sphere})} > a_{(\text{disc})} \quad \therefore \text{sphere reaches first}$$

22. $i = 45^\circ$; $A = 60^\circ$; $\delta_m = 2i - A = 30^\circ$

$$\mu = \frac{\sin \left(\frac{A + \delta_m}{2} \right)}{\sin A / 2} = \frac{\sin 45^\circ}{\sin 30^\circ} = \frac{1}{\sqrt{2}} \cdot \frac{2}{1} = \sqrt{2}$$

23. At closest distance of approach, the kinetic energy of the particle will convert completely into electrostatic potential energy.

$$\Rightarrow \frac{1}{2} mv^2 = \frac{KZe^2}{d_{\min}} \Rightarrow d_{\min} \propto \frac{1}{m}$$

24. By using work-energy theorem, $W = \Delta KE$

$$\Rightarrow (ma_t) (4\pi R) = \frac{1}{2} mv^2$$

$$\Rightarrow a_t = \frac{\left(\frac{1}{2} mv^2 \right)}{4\pi mR}$$

$$\Rightarrow a_t = \frac{8 \times 10^{-4}}{4 \times 3.14 \times 10 \times 10^{-3} \times 6.4 \times 10^{-2}} = 0.1 \text{ m/s}^2$$

OR

$$\frac{1}{2} mv^2 = KE \Rightarrow \frac{1}{2} \left(\frac{10}{1000} \right) v^2 = 8 \times 10^{-4}$$

$$\Rightarrow v^2 = 16 \times 10^{-2} \Rightarrow v = 4 \times 10^{-1} = 0.4 \text{ m/s}$$

Now,

$$v^2 = u^2 + 2a_t s \quad (s = 4\pi R)$$

$$\Rightarrow \frac{16}{100} = 0^2 + 2a_t \left(4 \times \frac{22}{7} \times \frac{6.4}{100} \right)$$

$$\Rightarrow a_t = \frac{16}{100} \times \frac{7 \times 100}{8 \times 22 \times 6.4} = 0.1 \text{ m/s}^2$$

25. $v \propto \sqrt{T} \Rightarrow \frac{v}{200} = \sqrt{\frac{400}{300}} \Rightarrow v = \frac{400}{\sqrt{3}} \text{ m/s}$

26. For points inside the wire

$$B = \frac{\mu_0 I r}{2\pi R^2} \quad (r \leq R)$$

For points outside the wire

$$B = \frac{\mu_0 I}{2\pi r} \quad (r \geq R)$$

according to the question

$$\frac{B}{B'} = \frac{\frac{\mu_0 I (a/2)}{2\pi a^2}}{\frac{\mu_0 I}{2\pi (2a)}} = 1 : 1$$

27. $\vec{r} = \cos \omega t \hat{x} + \sin \omega t \hat{y}$

$$\Rightarrow \vec{v} = \frac{d\vec{r}}{dt} = -\omega \sin \omega t \hat{x} + \omega \cos \omega t \hat{y}$$

$$\Rightarrow \vec{a} = \frac{d\vec{v}}{dt} = -\omega^2 \cos \omega t \hat{x} - \omega^2 \sin \omega t \hat{y} = -\omega^2 \vec{r}$$

\vec{a} is directed towards the origin.

Also $\vec{r} \cdot \vec{v} = 0$ hence $\vec{r} \perp \vec{v}$

28. When minimum speed of body is $\sqrt{5gR}$, then **no matter from where it enters the loop, it will complete full vertical loop.**

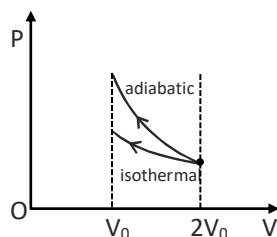
29. $eV = \frac{hc}{\lambda} - \frac{hc}{\lambda_0} \quad \dots(i)$

$$\frac{eV}{4} = \frac{hc}{2\lambda} - \frac{hc}{\lambda_0} \quad \dots(ii)$$

From equation (i) and (ii)

$$\Rightarrow 4 = \frac{\frac{1}{\lambda} - \frac{1}{\lambda_0}}{\frac{1}{2\lambda} - \frac{1}{\lambda_0}} \quad \text{On solving } \lambda_0 = 3\lambda$$

30.



$W_{\text{ext}} = \text{negative of area with volume-axis}$

$W(\text{adiabatic}) > W(\text{isothermal})$

31. Here $\frac{E_1 + E_2}{E_1 - E_2} = \frac{50}{10}$

$$\Rightarrow \frac{2E_1}{2E_2} = \frac{50+10}{50-10} = \frac{60}{40} \Rightarrow \frac{E_1}{E_2} = \frac{3}{2}$$

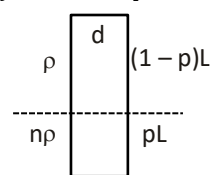
32. Using lens formula for objective lens

$$\frac{1}{v_0} - \frac{1}{u_0} = \frac{1}{f_0} \Rightarrow \frac{1}{v_0} = \frac{1}{f_0} + \frac{1}{u_0}$$

$$\Rightarrow \frac{1}{v_0} = \frac{1}{40} + \frac{1}{-200} = \frac{+5-1}{200} \Rightarrow v_0 = 50 \text{ cm}$$

Tube length $\ell = |v_0| + f_e = 50 + 4 = 54 \text{ cm}$.

33. Weight of cylinder = Upthrust by the two liquids



$$L A d g = (pL) A (n\rho)g + (1-p) L A \rho g$$

$$\Rightarrow d = (1-p)\rho + pn\rho = [1 + (n-1)p]\rho$$

34. $Y = (A+B) \cdot C = 1 \Rightarrow C = 1$

35. $\frac{mgh}{4} = mL$

$$\Rightarrow h = \frac{4L}{g} = \frac{4 \times 3.4 \times 10^5}{10} = 136 \text{ km}.$$

36. Escape Velocity = $\sqrt{\frac{2GM}{R}} = \sqrt{\frac{2G}{R} \cdot \left(\frac{4}{3}\pi R^3 \rho\right)} \propto R\sqrt{\rho}$

$$\therefore \text{Ratio, } \frac{v_e}{v_p} = 1 : 2\sqrt{2}$$

37. $|\vec{A} + \vec{B}| = |\vec{A} - \vec{B}|$

$$\Rightarrow A^2 + B^2 + 2AB \cos \theta = A^2 + B^2 - 2AB \cos \theta$$

$$\Rightarrow \cos \theta = 0 \Rightarrow \theta = 90^\circ.$$

38. Wave number, $\frac{1}{\lambda} = RZ^2 \left(\frac{1}{n_2^2} - \frac{1}{n_1^2} \right)$

$$= 10^7 \times 1^2 \left(\frac{1}{2^2} - \frac{1}{\infty^2} \right) = 0.25 \times 10^7 \text{ m}^{-1}$$

39. $\vec{F} = 2t\hat{i} + 3t^2\hat{j} \Rightarrow m \frac{d\vec{v}}{dt} = 2t\hat{i} + 3t^2\hat{j} \{m = 1 \text{ kg}\}$

$$\Rightarrow \int_0^{\vec{v}} d\vec{v} = \int_0^t (2t\hat{i} + 3t^2\hat{j}) dt \Rightarrow \vec{v} = t^2\hat{i} + t^3\hat{j}$$

$$\text{Power} = \vec{F} \cdot \vec{v} = (2t^3 + 3t^5)W$$

$$40. X_C = \frac{1}{\omega C} = \frac{1}{340 \times 50 \times 10^{-6}} = 58.8 \Omega$$

$$X_L = \omega L = 340 \times 20 \times 10^{-3} = 6.8 \Omega$$

$$Z = \sqrt{R^2 + (X_C - X_L)^2} \\ = \sqrt{40^2 + (58.8 - 6.8)^2} = \sqrt{4304} \Omega$$

$$P = i_{rms}^2 R = \left(\frac{V_{rms}}{Z} \right)^2 R \\ = \left(\frac{10/\sqrt{2}}{\sqrt{4304}} \right)^2 \times 40 = \frac{50 \times 40}{4304} = 0.47 \text{ W}$$

So best answer (nearest answer) will be (1)

$$41. v = At + Bt^2 \Rightarrow \frac{ds}{dt} = At + Bt^2$$

$$\Rightarrow \int_0^s ds = \int_0^t (At + Bt^2) dt$$

$$\Rightarrow s = \frac{A}{2}(2^2 - 1^2) + \frac{B}{3}(2^3 - 1^3) = \frac{3A}{2} + \frac{7B}{3}$$

$$42. \text{Flux linked with each turn} = 4 \times 10^{-3} \text{ Wb}$$

$$\therefore \text{Total flux linked} = 1000[4 \times 10^{-3}] \text{ Wb} = 4 \text{ Wb}$$

$$\phi_{\text{total}} = L i = 4 \Rightarrow L = 1 \text{ H}$$

$$43. \text{Input voltage, } V(t) = V_0 \sin \omega t$$

$$\text{For capacitor, } I(t) = \frac{dq}{dt} = C \frac{dV}{dt} = \omega C V_0 \cos \omega t$$

$$\Rightarrow \text{Current } I(t) \text{ leads voltage } V(t) \text{ by } 90^\circ$$

Also, Capacitor does not consume any energy over a full cycle.

$$44. \text{For spherical mirrors}$$

$$m = +ve \Rightarrow \text{virtual image}$$

$$m = -ve \Rightarrow \text{real image}$$

$$|m| > 1 \Rightarrow \text{magnified image}$$

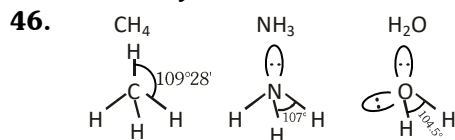
$$|m| < 1 \Rightarrow \text{diminished image}$$

$$45. \frac{v^2}{Rg} = \tan(\phi + \theta) = \frac{\tan \phi + \tan \theta}{1 - \tan \phi \tan \theta} = \left(\frac{\mu_s + \tan \theta}{1 - \mu_s \tan \theta} \right)$$

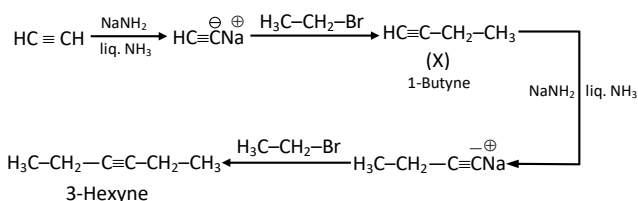
$$\Rightarrow v = \sqrt{Rg \left[\frac{\mu_s + \tan \theta}{1 - \mu_s \tan \theta} \right]} \quad (\mu_s = \tan \phi)$$

OR

Check by dimensions.



47.



$$48. \text{Acidic strength} \propto \text{EN} \propto +ve \text{ O.S.}$$

$$\text{HClO} < \text{HClO}_2 < \text{HClO}_3 < \text{HClO}_4$$

+1 +3 +5 +7

$$49. K = \frac{2.303}{(t_2 - t_1)} \log \frac{(a - x_1)}{(a - x_2)}$$

$$K = \frac{2.303}{(20 - 10)} \log \left(\frac{0.04}{0.03} \right)$$

$$K = \frac{2.303 \times 0.1249}{10}$$

$$\frac{2.303 \times \log 2}{t_{1/2}} = \frac{2.303 \times 0.1249}{10}$$

$$t_{1/2} = \frac{0.3010 \times 10}{0.1249} = 24.1 \text{ sec}$$

$$50. \text{Adsorption is spontaneous process,}$$

$$\text{so } \Delta G = \text{negative}$$

$$\text{Adsorption is exothermic process,}$$

$$\text{so } \Delta H = \text{negative}$$

$$\text{In adsorption entropy decreases,}$$

$$\text{so } \Delta S = \text{negative}$$

$$\text{so } \Delta G, \Delta H \text{ and } \Delta S \text{ all are negative}$$

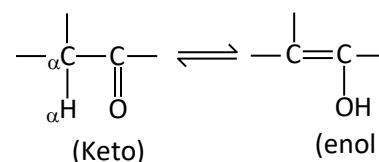
$$51. (2) \text{ B} < \text{C} < \text{N} < \text{O} \text{ (given I.P. order)}$$

$$\text{B} < \text{C} < \text{O} < \text{N} \text{ (correct)}$$

$$(3) \text{ I} < \text{Br} < \text{Cl} < \text{F} \text{ (given } \Delta H_{\text{eg}} \text{ order)}$$

$$\text{I} < \text{Br} < \text{F} < \text{Cl} \text{ (Correct)}$$

$$54. \text{Keto-enol Tautomerism}$$



$$55. \text{MY} \rightarrow K_{sp} = s^2 = 6.2 \times 10^{-13}$$

$$s = \sqrt{6.2 \times 10^{-13}}$$

$$s = 7.87 \times 10^{-7} \text{ mol L}^{-1}$$

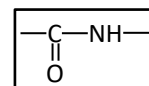
$$\text{NY}_3 \rightarrow K_{sp} = 27 s^4 = 6.2 \times 10^{-13}$$

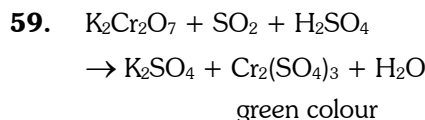
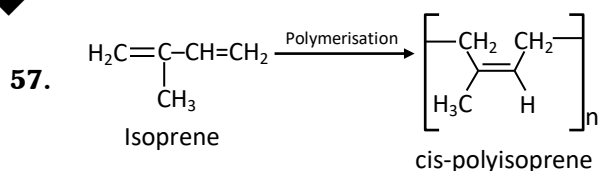
$$s = \left(\frac{6.2 \times 10^{-13}}{27} \right)^{1/4}$$

$$s = 3.89 \times 10^{-4} \text{ mol L}^{-1}$$

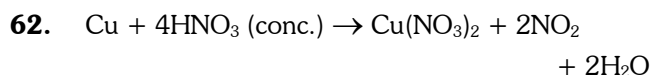
\therefore molar solubility of NY_3 is more than MY in water.

$$56. \text{Peptide bond}$$





61. Two electrons occupying the same orbital differ by spin quantum number.



64. $\Delta G = \Delta H - T\Delta S$
For, $\Delta H < 0$ and $\Delta S > 0$, $\Delta G = -ve$ (always)
 \therefore spontaneous at all temperatures.

65.
$$\rho = \frac{Z \times M}{N_A \times a^3}$$

For bcc structure

$Z = 2, \rho = 530 \text{ kg m}^{-3} = 0.530 \text{ g cm}^{-3}$

$$0.530 = \frac{2 \times 6.94}{6.02 \times 10^{23} \times a^3}$$

$a^3 = 4.348 \times 10^{-23} \text{ cm}^3$

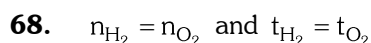
$a = 3.52 \times 10^{-8} \text{ cm}$

$a = 352 \text{ pm}$



due to high $\ell p-\ell p$ repulsion

67. Novalgin used as analgesic



According to Graham's law

$$\frac{r_{\text{H}_2}}{r_{\text{O}_2}} = \sqrt{\frac{M_{\text{O}_2}}{M_{\text{H}_2}}} \Rightarrow \frac{v_1 / t_1}{v_2 / t_2} = \sqrt{\frac{32}{2}}$$

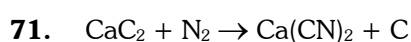
$$\frac{1/2}{1/x} = \sqrt{16} = 4$$

$$\frac{x}{2} = 4$$

$\therefore x = 8$

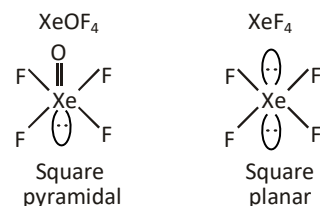
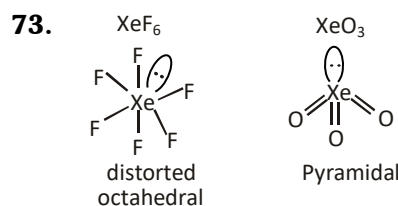
\therefore Fraction of $\text{O}_2 = 1/8$

69. Slower, as large amount of HSO_4^- will decrease ionisation of H_2SO_4 that result in lesser ionisation of nitric acid and lesser formation of nitronium ion $[\text{NO}_2^+]$

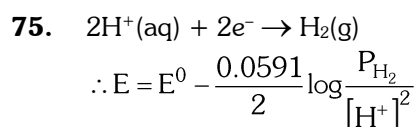


72. Clausius - Clapeyron's equation

$$\frac{d \ln P}{dT} = \frac{\Delta H_v}{RT^2}$$



74. $[\text{Fe}(\text{CO})_4]^{2-}$
Since metal atom is carrying maximum $-ve$ charge therefore it would show maximum synergic bonding as as result C-O bond length would be maximum.



$0 = 0 - 0.0295 \log \frac{P_{\text{H}_2}}{(10^{-7})^2}$

$$\frac{P_{\text{H}_2}}{(10^{-7})^2} = 1$$

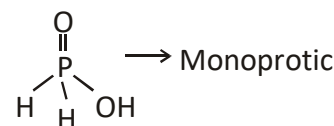
$P_{\text{H}_2} = 10^{-14} \text{ atm}$

76. The addition of catalyst during a chemical reaction alters the activation energy.

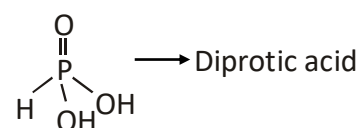
77. radii ratio = $\frac{r_+}{r_-} = \frac{0.98 \times 10^{-10}}{1.81 \times 10^{-10}} = 0.54$

radii ratio is in between 0.414 to 0.732
so, coordination number is 6

78. Phosphinic acid (H_3PO_2)



Phosphonic acid (H_3PO_3)



79. Fog is a colloidal solution of liquid in gas

80. A \rightarrow benzene, B \rightarrow toluene
1 : 1 molar mixture of A and B

$$\therefore x_A = \frac{1}{2} \text{ and } x_B = \frac{1}{2}$$

$$P_s = P_A^0 x_A + P_B^0 x_B$$

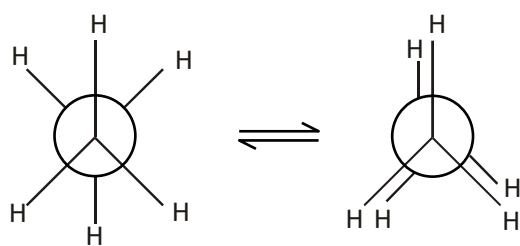
$$P_s = 12.8 \times \frac{1}{2} + 3.85 \times \frac{1}{2} = 8.325 \text{ kPa}$$

$$Y_A = \frac{P_A^0 x_A}{P_s} = \frac{12.8 \times \frac{1}{2}}{8.325} = 0.768$$

$$\therefore Y_B = 1 - Y_A = 1 - 0.768 = 0.232$$

so, the vapour will contain higher percentage of benzene.

81.

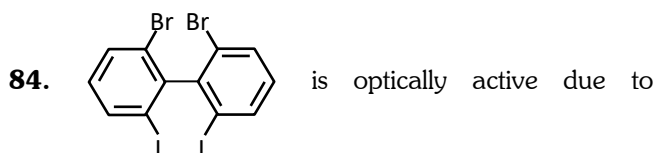
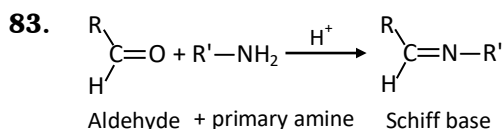


Staggered form

* No torsional strain

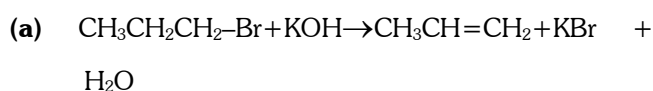
Eclipsed form

82. This is an example of Williamson ether synthesis reaction in which sodium alkoxide reacts with alkyl halide and gives ether.

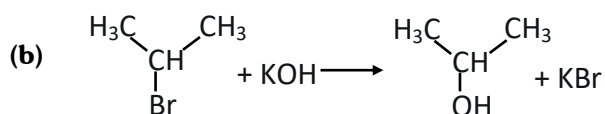


absence of plane of symmetry and center of symmetry

85.

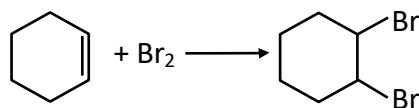


breaking of 2σ bonds and formation of 1π bond so it is an example of elimination reaction.



replacement of Br^- by OH^- is substitution reaction

(c)



breaking of 1π bond and formation of 2σ bonds is addition reaction

$$86. \left(\frac{P^0 - P_s}{P^0} \right) = \frac{n}{N} = \frac{w_{\text{solute}}}{M_{\text{solute}}} \times \frac{M_{\text{solvent}}}{w_{\text{solvent}}}$$

at 100°C , $P^0 = 760 \text{ mm}$

$$\frac{760 - 732}{760} = \frac{6.5 \times 18}{M_{\text{solute}} \times 100}$$

$$M_{\text{solute}} = 31.75 \text{ g mol}^{-1}$$

$$\Delta T_b = m \times K_b = \frac{w_{\text{solute}} \times 1000}{M_{\text{solute}} \times w_{\text{solvent}}} \times K_b$$

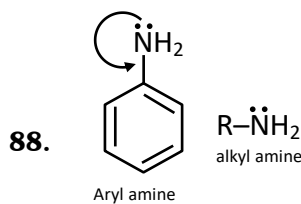
$$\Delta T_b = \frac{0.52 \times 6.5 \times 1000}{31.75 \times 100} = 1.06^\circ\text{C}$$

\therefore boiling point of solution

$$= 100^\circ\text{C} + 1.06^\circ\text{C} \approx 101^\circ\text{C}$$

87. RNA \rightarrow Ribose Nucleic Acid

DNA \rightarrow 2'-Deoxyribose Nucleic Acid



* Delocalized lone pair of nitrogen

* less basic

90. $\text{CH}_3-\text{C} \equiv \text{C}^\ominus$

$$\left. \begin{array}{l} \text{No. of } \sigma \text{ bp} - 1 \\ \ell \text{ p} - 1 \end{array} \right\} 2 \text{ \& hybridisation is sp}$$

RE-AIPMT - 2015

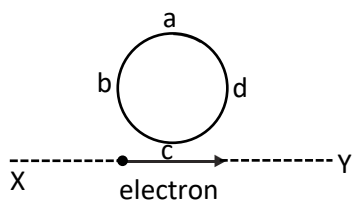
1. In the spectrum of hydrogen, the ratio of the longest wavelength in the Lyman series to the longest wavelength in the Balmer series is :

(1) $\frac{5}{27}$ (2) $\frac{4}{9}$ (3) $\frac{9}{4}$ (4) $\frac{27}{5}$

2. The energy of the em waves is of the order of 15 keV. To which part of the spectrum does it belong?

- (1) γ -rays (2) X-rays
(3) Infra-red rays (4) Ultraviolet rays

3. An electron moves on a straight line path XY as shown. The abcd is a coil adjacent to the path of electron. What will be the direction of current, if any, induced in the coil ?



- (1) No current induced
(2) abcd
(3) adcd
(4) The current will reverse its direction as the electron goes past the coil
4. The cylindrical tube of a spray pump has radius R , one end of which has n fine holes, each of radius r . If the speed of the liquid in the tube is V , the speed of the ejection of the liquid through the holes is :

(1) $\frac{V^2 R}{nr}$ (2) $\frac{VR^2}{n^2 r^2}$ (3) $\frac{VR^2}{nr^2}$ (4) $\frac{VR^2}{n^3 r^2}$

5. The Young's modulus of steel is twice that of brass. Two wires of same length and of same area of cross section, one of steel and another of brass are suspended from the same roof. If we want the lower ends of the wires to be at the same level, then the weights added to the steel and brass wires must be in the ratio of :

- (1) 1 : 1 (2) 1 : 2
(3) 2 : 1 (4) 4 : 1

6. A potentiometer wire of length L and a resistance r are connected in series with a battery of e.m.f. E_0 and a resistance r_1 . An unknown e.m.f. E is balanced at a length ℓ of the potentiometer wire.

The e.m.f. E will be given by:

(1) $\frac{LE_0 r}{(r + r_1)\ell}$ (2) $\frac{LE_0 r}{\ell r_1}$
(3) $\frac{E_0 r}{(r + r_1)} \cdot \frac{\ell}{L}$ (4) $\frac{E_0 \ell}{L}$

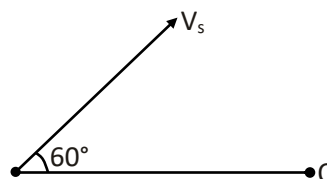
7. A particle is executing a simple harmonic motion. Its maximum acceleration is α and maximum velocity is β . Then, its time period of vibration will be :-

(1) $\frac{2\pi\beta}{\alpha}$ (2) $\frac{\beta^2}{\alpha^2}$ (3) $\frac{\alpha}{\beta}$ (4) $\frac{\beta^2}{\alpha}$

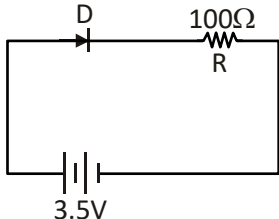
8. If vectors $\vec{A} = \cos\omega t \hat{i} + \sin\omega t \hat{j}$ and $\vec{B} = \cos\frac{\omega t}{2} \hat{i} + \sin\frac{\omega t}{2} \hat{j}$ are functions of time, then the value of t at which they are orthogonal to each other is :

(1) $t = 0$ (2) $t = \frac{\pi}{4\omega}$
(3) $t = \frac{\pi}{2\omega}$ (4) $t = \frac{\pi}{\omega}$

9. A source of sound S emitting waves of frequency 100 Hz and an observer O are located at some distance from each other. The source is moving with a speed of 19.4 ms^{-1} at an angle of 60° with the source observer line as shown in the figure. The observer is at rest. The apparent frequency observed by the observer (velocity of sound in air 330 ms^{-1}) is :-



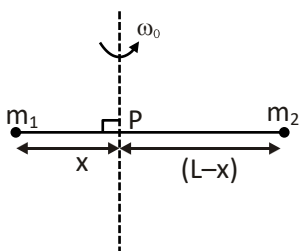
- (1) 97 Hz (2) 100 Hz
(3) 103 Hz (4) 106 Hz

10. An automobile moves on a road with a speed of 54 kmh^{-1} . The radius of its wheels is 0.45 m and the moment of inertia of the wheel about its axis of rotation is 3 kgm^2 . If the vehicle is brought to rest in 15s , the magnitude of average torque transmitted by its brakes to wheel is :-
- $2.86 \text{ kg m}^2\text{s}^{-2}$
 - $6.66 \text{ kg m}^2\text{s}^{-2}$
 - $8.58 \text{ kg m}^2\text{s}^{-2}$
 - $10.86 \text{ kg m}^2\text{s}^{-2}$
11. A rectangular coil of length 0.12m and width 0.1m having 50 turns of wire is suspended vertically in a uniform magnetic field of strength 0.2 Weber/m^2 . The coil carries a current of 2 A . If the plane of the coil is inclined at an angle of 30° with the direction of the field, the torque required to keep the coil in stable equilibrium will be:
- 0.12 Nm
 - 0.15 Nm
 - 0.20 Nm
 - 0.24 Nm
12. A parallel plate air capacitor has capacity ' C ' distance of separation between plates is ' d ' and potential difference ' V ' is applied between the plates force of attraction between the plates of the parallel plate air capacitor is :
- $\frac{C^2 V^2}{2d^2}$
 - $\frac{C^2 V^2}{2d}$
 - $\frac{CV^2}{2d}$
 - $\frac{CV^2}{d}$
13. Two vessels separately contain two ideal gases A and B at the same temperature, the pressure of A being twice that of B. Under such conditions, the density of A is found to be 1.5 times the density of B. The ratio of molecular weight of A and B is :
- $\frac{1}{2}$
 - $\frac{2}{3}$
 - $\frac{3}{4}$
 - 2
14. A satellite S is moving in an elliptical orbit around the earth. The mass of the satellite is very small compared to the mass of the earth. Then,
- the acceleration of S is always directed towards the centre of the earth.
 - the angular momentum of S about the centre of the earth changes in direction, but its magnitude remains constant.
 - the total mechanical energy of S varies periodically with time.
 - the linear momentum of S remains constant in magnitude.
15. In the given figure, a diode D is connected to an external resistance $R = 100 \Omega$ and an e.m.f of 3.5V . If the barrier potential developed across the diode is 0.5 V , the current in the circuit will be :
- 
- 35 mA
 - 30 mA
 - 40 mA
 - 20 mA
16. A remote - sensing satellite of earth revolves in a circular orbit at a height of $0.25 \times 10^6 \text{ m}$ above the surface of earth. If earth's radius is $6.38 \times 10^6 \text{ m}$ and $g=9.8 \text{ ms}^{-2}$, then the orbital speed of the satellite is :
- 6.67 km s^{-1}
 - 7.76 km s^{-1}
 - 8.56 km s^{-1}
 - 9.13 km s^{-1}
17. The position vector of a particle \vec{R} as a function of time is given by :-
 $\vec{R} = 4 \sin(2\pi t)\hat{i} + 4 \cos(2\pi t)\hat{j}$
 Where R is in meters, t is in seconds and \hat{i} and \hat{j} denote unit vectors along x and y -directions, respectively. Which one of the following statements is wrong for the motion of particle ?
- Path of the particle is a circle of radius 4 meter
 - Acceleration vectors is along $-\vec{R}$
 - Magnitude of acceleration vector is $\frac{v^2}{R}$ where v is the velocity of particle.
 - Magnitude of the velocity of particle is 8 meter/second

18. A string is stretched between fixed points separated by 75.0 cm. It is observed to have resonant frequencies of 420 Hz and 315 Hz. There are no other resonant frequencies between these two. The lowest resonant frequencies for this string is :

- (1) 105 Hz (2) 155 Hz
(3) 205 Hz (4) 10.5 Hz

19. Point masses m_1 and m_2 are placed at the opposite ends of a rigid rod of length L , and negligible mass. The rod is to be set rotating about an axis perpendicular to it. The position of point P on this rod through which the axis should pass so that the work required to set the rod rotating with angular velocity ω_0 is minimum, is given by:-



- (1) $x = \frac{m_2 L}{m_1 + m_2}$ (2) $x = \frac{m_1 L}{m_1 + m_2}$
(3) $x = \frac{m_1}{m_2} L$ (4) $x = \frac{m_2}{m_1} L$

20. At the first minimum adjacent to the central maximum of a single-slit diffraction pattern the phase difference between the Huygen's wavelet from the edge of the slit and the wavelet from the mid point of the slit is :-

- (1) $\frac{\pi}{8}$ radian (2) $\frac{\pi}{4}$ radian
(3) $\frac{\pi}{2}$ radian (4) π radian

21. A force $\vec{F} = \alpha \hat{i} + 3\hat{j} + 6\hat{k}$ is acting at a point $\vec{r} = 2\hat{i} - 6\hat{j} - 12\hat{k}$. The value of α for which angular momentum about origin is conserved is :

- (1) 1 (2) -1
(3) 2 (4) zero

22. Two particles A and B, move with constant velocities \vec{v}_1 and \vec{v}_2 . At the initial moment their position vectors are \vec{r}_1 and \vec{r}_2 respectively. The condition for particle A and B for their collision is:

- (1) $\vec{r}_1 - \vec{r}_2 = \vec{v}_1 - \vec{v}_2$ (2) $\frac{\vec{r}_1 - \vec{r}_2}{|\vec{r}_1 - \vec{r}_2|} = \frac{\vec{v}_2 - \vec{v}_1}{|\vec{v}_2 - \vec{v}_1|}$
(3) $\vec{r}_1 \cdot \vec{v}_1 = \vec{r}_2 \cdot \vec{v}_2$ (4) $\vec{r}_1 \times \vec{v}_1 = \vec{r}_2 \times \vec{v}_2$

23. A nucleus of uranium decays at rest into nuclei of Thorium and Helium. Then :-

- (1) The Helium nucleus has less kinetic energy than the Thorium nucleus
(2) The Helium has more kinetic energy than the Thorium nucleus.
(3) The Helium nucleus has less momentum than the Thorium nucleus.
(4) The Helium nucleus has more momentum than the Thorium nucleus.

24. Two metal wires of identical dimensions are connected in series. If σ_1 and σ_2 are the conductivities of the metal wires respectively, the effective conductivity of the combination is :-

- (1) $\frac{\sigma_1 \sigma_2}{\sigma_1 + \sigma_2}$ (2) $\frac{2\sigma_1 \sigma_2}{\sigma_1 + \sigma_2}$
(3) $\frac{\sigma_1 + \sigma_2}{2\sigma_1 \sigma_2}$ (4) $\frac{\sigma_1 + \sigma_2}{\sigma_1 \sigma_2}$

25. Light of wavelength 500 nm is incident on a metal with work function 2.28 eV. The de Broglie wavelength of the emitted electron is :-

- (1) $\leq 2.8 \times 10^{-12} \text{ m}$ (2) $< 2.8 \times 10^{-10} \text{ m}$
(3) $< 2.8 \times 10^{-9} \text{ m}$ (4) $\geq 2.8 \times 10^{-9} \text{ m}$

26. 4.0 g of a gas occupies 22.4 litres at NTP. The specific heat capacity of the gas at constant volume is $5.0 \text{ JK}^{-1} \text{ mol}^{-1}$. If the speed of sound in this gas at NTP is 952 ms^{-1} , then the heat capacity at constant pressure is (Take gas constant $R = 8.3 \text{ JK}^{-1} \text{ mol}^{-1}$)

- (1) $8.5 \text{ JK}^{-1} \text{ mol}^{-1}$ (2) $8.0 \text{ JK}^{-1} \text{ mol}^{-1}$
(3) $7.5 \text{ JK}^{-1} \text{ mol}^{-1}$ (4) $7.0 \text{ JK}^{-1} \text{ mol}^{-1}$

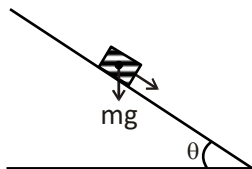
27. A series R-C circuit is connected to an alternating voltage source. Consider two situations :-

- (a) When capacitor is air filled.
(b) When capacitor is mica filled.

Current through resistor is i and voltage across capacitor is V then :-

- (1) $V_a = V_b$ (2) $V_a < V_b$
(3) $V_a > V_b$ (4) $i_a > i_b$

28. A plank with a box on it at one end is gradually raised about the other end. As the angle of inclination with the horizontal reaches 30° , the box starts to slip and slides 4.0 m down the plank in 4.0s. The coefficients of static and kinetic friction between the box and the plank will be, respectively :



- (1) 0.4 and 0.3 (2) 0.6 and 0.6
(3) 0.6 and 0.5 (4) 0.5 and 0.6

29. Two stones of masses m and $2m$ are whirled in horizontal circles, the heavier one in a radius $\frac{r}{2}$ and the lighter one in radius r . The tangential speed of lighter stone is n times that of the value of heavier stone when they experience same centripetal forces. The value of n is :

- (1) 1 (2) 2 (3) 3 (4) 4

30. The coefficient of performance of a refrigerator is 5. If the temperature inside freezer is -20°C , the temperature of the surroundings to which it rejects heat is :

- (1) 21°C (2) 31°C
(3) 41°C (4) 11°C

31. An ideal gas is compressed to half its initial volume by means of several processes. Which of the process results in the maximum work done on the gas ?

- (1) Isothermal (2) Adiabatic
(3) Isobaric (4) Isochoric

32. A ball is thrown vertically downwards from a height of 20 m with an initial velocity u_0 . It collides with the ground, loses 50 percent of its energy in collision and rebounds to the same height. The initial velocity u_0 is :

(Take $g = 10 \text{ ms}^{-2}$)

- (1) 10 ms^{-1} (2) 14 ms^{-1}
(3) 20 ms^{-1} (4) 28 ms^{-1}

33. On a frictionless surface, a block of mass M moving at speed v collides elastically with another block of same mass M which is initially at rest. After collision the first block moves at an angle θ to its initial direction and has a speed $\frac{v}{3}$.

The second block's speed after the collision is :-

- (1) $\frac{\sqrt{3}}{2}v$ (2) $\frac{2\sqrt{2}}{3}v$ (3) $\frac{3}{4}v$ (4) $\frac{3}{\sqrt{2}}v$

34. If potential (in volts) in a region is expressed as $V(x,y,z) = 6xy - y + 2yz$, the electric field (in N/C) at point $(1,1,0)$ is :

- (1) $-(6\hat{i} + 9\hat{j} + k)$ (2) $-(3\hat{i} + 5\hat{j} + 3k)$
(3) $-(6\hat{i} + 5\hat{j} + 2k)$ (4) $-(2\hat{i} + 3\hat{j} + k)$

35. Two slits in Youngs experiment have widths in the ratio 1 : 25. The ratio of intensity at the maxima and minima in the interference pattern, $\frac{I_{\max}}{I_{\min}}$ is :

- (1) $\frac{4}{9}$ (2) $\frac{9}{4}$ (3) $\frac{121}{49}$ (4) $\frac{49}{121}$

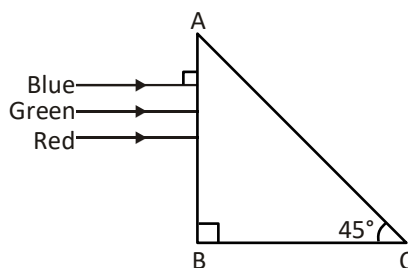
36. The heart of a man pumps 5 litres of blood through the arteries per minute at a pressure of 150 mm of mercury. If the density of mercury be $13.6 \times 10^3 \text{ kg/m}^3$ and $g = 10 \text{ m/s}^2$ then the power of heart in watt is:

- (1) 1.50 (2) 1.70 (3) 2.35 (4) 3.0

37. A proton and an alpha particle both enter a region of uniform magnetic field, B , moving at right angles to the field B . If the radius of circular orbits for both the particles is equal and the kinetic energy acquired by proton is 1 MeV, the energy acquired by the alpha particle will be :-

- (1) 1 MeV (2) 4 MeV
(3) 0.5 MeV (4) 1.5 MeV

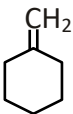
- 38.** The input signal given to a CE amplifier having a voltage gain of 150 is $V_i = 2 \cos \left(15t + \frac{\pi}{3} \right)$. The corresponding output signal will be -
- (1) $300 \cos \left(15t + \frac{4\pi}{3} \right)$
 (2) $300 \cos \left(15t + \frac{\pi}{3} \right)$
 (3) $75 \cos \left(15t + \frac{2\pi}{3} \right)$
 (4) $2 \cos \left(15t + \frac{5\pi}{6} \right)$
- 39.** In dimension of critical velocity v_c , of liquid following through a tube are expressed as $(\eta^x \rho^y r^z)$, where η , ρ and r are the coefficient of viscosity of liquid, density of liquid and radius of the tube respectively, then the values of x , y and z are given by :
- (1) 1, 1, 1 (2) 1, -1, -1
 (3) -1, -1, 1 (4) -1, -1, -1
- 40.** A circuit contains an ammeter, a battery of 30 V and a resistance 40.8 ohm all connected in series. If the ammeter has a coil of resistance 480 ohm and a shunt of 20 ohm, the reading in the ammeter will be :-
- (1) 1 A (2) 0.5 A
 (3) 0.25 A (4) 2 A
- 41.** Water rises to height 'h' in capillary tube. If the length of capillary tube above the surface of water is made less than 'h', then-
- (1) water does not rise at all.
 (2) water rises upto the tip of capillary tube and then starts overflowing like a fountain.
 (3) water rises upto the top of capillary tube and stays there without overflowing.
 (4) water rises upto a point a little below the top and stays there.
- 42.** In an astronomical telescope in normal adjustment a straight black line of length L is drawn on inside part of objective lens. The eye-piece forms a real image of this line. The length of this image is I . The magnification of the telescope is :
- (1) $\frac{L}{I}$ (2) $\frac{L}{I} + 1$ (3) $\frac{L}{I} - 1$ (4) $\frac{L+I}{L-I}$
- 43.** The value of coefficient of volume expansion of glycerin is $5 \times 10^{-4} \text{ K}^{-1}$. The fractional change in the density of glycerin for a rise of 40°C in its temperature, is :-
- (1) 0.010 (2) 0.015
 (3) 0.020 (4) 0.025
- 44.** A photoelectric surface is illuminated successively by monochromatic light of wavelength λ and $\frac{\lambda}{2}$. If the maximum kinetic energy of the emitted photoelectrons in the second case is 3 times that in the first case, the work function of the surface of the material is :
- (h = Planck's constant, c = speed of light)
- (1) $\frac{hc}{3\lambda}$ (2) $\frac{hc}{2\lambda}$ (3) $\frac{hc}{\lambda}$ (4) $\frac{2hc}{\lambda}$
- 45.** A beam of light consisting of red, green and blue colours is incident on a right angled prism. The refractive index of the material of the prism for the above red, green and blue wavelengths are 1.39, 1.44 and 1.47, respectively.



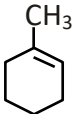
The prism will :-

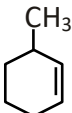
- (1) separate the red colour part from the green and blue colours
 (2) separate the blue colour part from the red and green colours
 (3) separate all the three colours from one another
 (4) not separate the three colours at all

- 46.** 2,3-Dimethyl-2-butene can be prepared by heating which of the following compounds with a strong acid ?
- (1) $(\text{CH}_3)_2\text{C}=\text{CH}-\text{CH}_2-\text{CH}_3$
 - (2) $(\text{CH}_3)_2\text{CH}-\text{CH}_2-\text{CH}=\text{CH}_2$
 - (3) $(\text{CH}_3)_2\text{CH}-\underset{\text{CH}_3}{\text{CH}}-\text{CH}=\text{CH}_2$
 - (4) $(\text{CH}_3)_3\text{C}-\text{CH}=\text{CH}_2$
- 47.** Gadolinium belongs to 4f series. Its atomic number is 64. Which of the following is the correct electronic configuration of gadolinium?
- (1) $[\text{Xe}] 4f^7 5d^1 6s^2$
 - (2) $[\text{Xe}] 4f^6 5d^2 6s^2$
 - (3) $[\text{Xe}] 4f^8 6d^2$
 - (4) $[\text{Xe}] 4f^9 5s^1$
- 48.** The formation of the oxide ion, $\text{O}^{2-}(\text{g})$, from oxygen atom requires first an exothermic and then an endothermic step as shown below :
- $$\text{O}(\text{g}) + e^- \rightarrow \text{O}(\text{g})^- ; \Delta_f H^\ominus = -141 \text{ kJ mol}^{-1}$$
- $$\text{O}(\text{g})^- + e^- \rightarrow \text{O}(\text{g})^{2-} ; \Delta_f H^\ominus = +780 \text{ kJ mol}^{-1}$$
- Thus process of formation of O^{2-} in gas phase is unfavourable even though O^{2-} is isoelectronic with neon. It is due to the fact that,
- (1) Oxygen is more electronegative
 - (2) Addition of electron in oxygen results in larger size of the ion
 - (3) Electron repulsion outweighs the stability gained by achieving noble gas configuration
 - (4) O^- ion has comparatively smaller size than oxygen atom
- 49.** The number of structural isomers possible from the molecular formula $\text{C}_3\text{H}_9\text{N}$ is :
- (1) 2
 - (2) 3
 - (3) 4
 - (4) 5
- 50.** If the equilibrium constant for $\text{N}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{NO}(\text{g})$ is K , the equilibrium constant for $\frac{1}{2}\text{N}_2(\text{g}) + \frac{1}{2}\text{O}_2(\text{g}) \rightleftharpoons \text{NO}(\text{g})$ will be:-
- (1) K
 - (2) K^2
 - (3) $K^{1/2}$
 - (4) $\frac{1}{2}K$
- 51.** Which one of the following pairs of solution is not an acidic buffer ?
- (1) H_2CO_3 and Na_2CO_3
 - (2) H_3PO_4 and Na_3PO_4
 - (3) HClO_4 and NaClO_4
 - (4) CH_3COOH and CH_3COONa
- 52.** Aqueous solution of which of the following compounds is the best conductor of electric current?
- (1) Ammonia, NH_3
 - (2) Fructose, $\text{C}_6\text{H}_{12}\text{O}_6$
 - (3) Acetic acid, $\text{C}_2\text{H}_4\text{O}_2$
 - (4) Hydrochloric acid, HCl
- 53.** Caprolactam is used for the manufacture of:
- (1) Terylene
 - (2) Nylon - 6, 6
 - (3) Nylon - 6
 - (4) Teflon
- 54.** On heating which of the following releases CO_2 most easily ?
- (1) MgCO_3
 - (2) CaCO_3
 - (3) K_2CO_3
 - (4) Na_2CO_3
- 55.** Strong reducing behaviour of H_3PO_2 is due to :
- (1) High oxidation state of phosphorus
 - (2) Presence of two $-\text{OH}$ groups and one $\text{P}-\text{H}$ bond
 - (3) Presence of one $-\text{OH}$ group and two $\text{P}-\text{H}$ bonds
 - (4) High electron gain enthalpy of phosphorus
- 56.** Decreasing order of stability of O_2 , O_2^- , O_2^+ and O_2^{2-} is :-
- (1) $\text{O}_2 > \text{O}_2^+ > \text{O}_2^{2-} > \text{O}_2^-$
 - (2) $\text{O}_2^- > \text{O}_2^{2-} > \text{O}_2^+ > \text{O}_2$
 - (3) $\text{O}_2^+ > \text{O}_2 > \text{O}_2^- > \text{O}_2^{2-}$
 - (4) $\text{O}_2^{2-} > \text{O}_2^- > \text{O}_2 > \text{O}_2^+$
- 57.** The number of water molecules is maximum in :-
- (1) 18 gram of water
 - (2) 18 moles of water
 - (3) 18 molecules of water
 - (4) 1.8 gram of water

58. In which of the following pairs, both the species are not isostructural ?
 (1) NH_3 , PH_3
 (2) XeF_4 , XeO_4
 (3) SiCl_4 , PCl_4^+
 (4) Diamond, silicon carbide
59. In the reaction with HCl , an alkene reacts in accordance with the Markovnikov's rule, to give a product 1-chloro-1-methylcyclohexane. The possible alkene is :-
- 

(1) (A)



(2) (B)
- (3) (A) and (B) (4) 
60. Assuming complete ionization, same moles of which of the following compounds will require the least amount of acidified KMnO_4 for complete oxidation?
 (1) FeC_2O_4 (2) $\text{Fe}(\text{NO}_2)_2$
 (3) FeSO_4 (4) FeSO_3
61. Reaction of phenol with chloroform in presence of dilute sodium hydroxide finally introduces which one of the following functional group ?
 (1) $-\text{CHCl}_2$ (2) $-\text{CHO}$
 (3) $-\text{CH}_2\text{Cl}$ (4) $-\text{COOH}$
62. The vacant space in bcc lattice unit cell is :
 (1) 23% (2) 32%
 (3) 26% (4) 48%
63. Which of the statements given below is incorrect?
 (1) ONF is isoelectronic with O_2N^-
 (2) OF_2 is an oxide of fluorine
 (3) Cl_2O_7 is an anhydride of perchloric acid
 (4) O_3 molecule is bent
64. The name of complex ion, $[\text{Fe}(\text{CN})_6]^{3-}$ is :-
 (1) Tricyanoferrate (III) ion
 (2) Hexacyanidoferrate (III) ion
 (3) Hexacyanoiron (III) ion
 (4) Hexacyanitoferrate (III) ion
65. If avogadro number N_A , is changed from $6.022 \times 10^{23} \text{ mol}^{-1}$ to $6.022 \times 10^{20} \text{ mol}^{-1}$, this would change :
 (1) the ratio of chemical species to each other in a balanced equation
 (2) the ratio of elements to each other in a compound
 (3) the definition of mass in units of grams
 (4) the mass of one mole of carbon
66. Which of the following statements is not correct for a nucleophile ?
 (1) Nucleophiles attack low e^- density sites
 (2) Nucleophiles are not electron seeking
 (3) Nucleophile is a Lewis acid
 (4) Ammonia is a nucleophile
67. A gas such as carbon monoxide would be most likely to obey the ideal gas law at :
 (1) high temperatures and high pressures
 (2) low temperatures and low pressures
 (3) high temperatures and low pressures
 (4) low temperatures and high pressures
68. The hybridization involved in complex $[\text{Ni}(\text{CN})_4]^{2-}$ is (At.No. $\text{Ni} = 28$)
 (1) d^2sp^2 (2) d^2sp^3
 (3) dsp^2 (4) sp^3
69. The heat of combustion of carbon to CO_2 is -393.5 kJ/mol . The heat released upon formation of 35.2 g of CO_2 from carbon and oxygen gas is:
 (1) -630 kJ (2) -3.15 kJ
 (3) -315 kJ (4) $+315 \text{ kJ}$
70. 20.0 g of a magnesium carbonate sample decomposes on heating to give carbon dioxide and 8.0 g magnesium oxide. What will be the percentage purity of magnesium carbonate in the sample ?
 (At. Wt. : $\text{Mg} = 24$)
 (1) 60 (2) 84
 (3) 75 (4) 96

71. What is the mole fraction of the solute in a 1.00 m aqueous solution ?

- (1) 0.0354
- (2) 0.0177
- (3) 0.177
- (4) 1.770

72. The correct statement regarding defects in crystalline solids is :-

- (1) Frenkel defect is a dislocation defect
- (2) Frenkel defect is found in halides of alkaline metals
- (3) Schottky defects have no effect on the density of crystalline solids
- (4) Frenkel defects decrease the density of crystalline solids

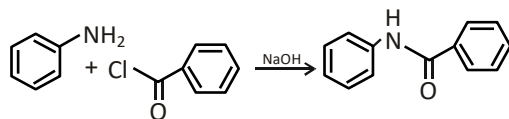
73. The stability of +1 oxidation state among Al, Ga, In and Tl increases in the sequence :

- (1) $Tl < In < Ga < Al$
- (2) $In < Tl < Ga < Al$
- (3) $Ga < In < Al < Tl$
- (4) $Al < Ga < In < Tl$

74. Two possible stereo-structures of $CH_3CHOHCOOH$, which are optically active, are called :-

- (1) Enantiomers
- (2) Mesomers
- (3) Diastereomers
- (4) Atropisomers

75. The following reaction



is known by the name :

- (1) Acetylation reaction
- (2) Schotten-Baumann reaction
- (3) Friedel-Craft's reaction
- (4) Perkin's reaction

76. The sum of coordination number and oxidation number of the metal M in the complex $[M(en)_2(C_2O_4)]Cl$ (where en is ethylenediamine) is :

- (1) 7
- (2) 8
- (3) 9
- (4) 6

77. Reaction of carbonyl compound with one of the following reagents involves nucleophilic addition followed by elimination of water. The reagent is :

- (1) hydrocyanic acid
- (2) sodium hydrogen sulphite
- (3) a Grignard reagent
- (4) hydrazine in presence of feebly acidic solution

78. Which one of the following esters gets hydrolysed most easily under alkaline conditions?

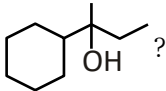
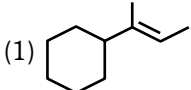
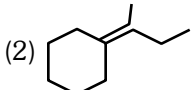
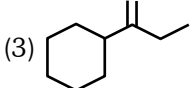
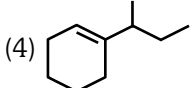
- (1)
- (2)
- (3)
- (4)

79. In an S_N1 reaction on chiral centres, there is:

- (1) 100% retention
- (2) 100% inversion
- (3) 100% racemization
- (4) inversion more than retention leading to partial racemization

80. The rate constant of the reaction $A \rightarrow B$ is 0.6×10^{-3} mole per second. If the concentration of A is 5 M, then concentration of B after 20 minutes is :-

- (1) 0.36 M
- (2) 0.72 M
- (3) 1.08 M
- (4) 3.60 M

- 81.** What is the pH of the resulting solution when equal volumes of 0.1 M NaOH and 0.01 M HCl are mixed?
 (1) 7.0 (2) 1.04
 (3) 12.65 (4) 2.0
- 82.** Number of possible isomers for the complex $[\text{Co}(\text{en})_2\text{Cl}_2]\text{Cl}$ will be : (en = ethylenediamine)
 (1) 3 (2) 4
 (3) 2 (4) 1
- 83.** The variation of the boiling points of the hydrogen halides is in the order $\text{HF} > \text{HI} > \text{HBr} > \text{HCl}$. What explains the higher boiling point of hydrogen fluoride ?
 (1) The bond energy of HF molecules is greater than in other hydrogen halides
 (2) The effect of nuclear shielding is much reduced in fluorine which polarises the HF molecule
 (3) The electronegativity of fluorine is much higher than for other elements in the group.
 (4) There is strong hydrogen bonding between HF molecules
- 84.** What is the mass of the precipitate formed when 50 mL of 16.9% solution of AgNO_3 is mixed with 50 mL of 5.8% NaCl solution ?
 (Ag = 107.8, N = 14, O = 16, Na = 23, Cl = 35.5)
 (1) 7 g
 (2) 14 g
 (3) 28 g
 (4) 3.5 g
- 85.** The oxidation of benzene by V_2O_5 in the presence of air produces :
 (1) benzoic acid
 (2) benzaldehyde
 (3) benzoic anhydride
 (4) maleic anhydride
- 86.** Which of the following is not the product of dehydration of  ?
 (1)  (2) 
 (3)  (4) 
- 87.** Method by which Aniline cannot be prepared is :
 (1) reduction of nitrobenzene with H_2/Pd in ethanol
 (2) potassium salt of phthalimide treated with chlorobenzene followed by hydrolysis with aqueous NaOH solution
 (3) hydrolysis of phenylisocyanide with acidic solution
 (4) degradation of benzamide with bromine in alkaline solution
- 88.** Which of the following reaction(s) can be used for the preparation of alkyl halides ?
 (I) $\text{CH}_3\text{CH}_2\text{OH} + \text{HCl} \xrightarrow{\text{anh. ZnCl}_2}$
 (II) $\text{CH}_3\text{CH}_2\text{OH} + \text{HCl} \longrightarrow$
 (III) $(\text{CH}_3)_3\text{COH} + \text{HCl} \longrightarrow$
 (IV) $(\text{CH}_3)_2\text{CHOH} + \text{HCl} \xrightarrow{\text{anh. ZnCl}_2}$
 (1) (IV) only (2) (III) and (IV) only
 (3) (I), (III) and (IV) only (4) (I) and (II) only
- 89.** Which is the correct order of increasing energy of the listed orbitals in the atom of titanium ?
 (At. no. Z = 22)
 (1) 3s 3p 3d 4s
 (2) 3s 3p 4s 3d
 (3) 3s 4s 3p 3d
 (4) 4s 3s 3p 3d
- 90.** In the extraction of copper from its sulphide ore, the metal is finally obtained by the reduction of cuprous oxide with :-
 (1) copper(I) sulphide
 (2) sulphur dioxide
 (3) iron(II) sulphide
 (4) carbon monoxide

91. Root pressure develops due to :
 (1) Increase in transpiration
 (2) Active absorption
 (3) Low osmotic potential in soil
 (4) Passive absorption
92. Which one is a **wrong** statement ?
 (1) Brown algae have chlorophyll a and c, and fucoxanthin
 (2) Archegonia are found in Bryophyta, Pteridophyta and Gymnosperms
 (3) *Mucor* has biflagellate zoospores
 (4) Haploid endosperm is typical feature of gymnosperms
93. Which of the following structures is **not** found in prokaryotic cells?
 (1) Plasma membrane
 (2) Nuclear envelope
 (3) Ribosome
 (4) Mesosome
94. Which one of the following animals has two separate circulatory pathways ?
 (1) Shark (2) Frog
 (3) Lizard (4) Whale
95. Most animals that live in deep oceanic waters are:
 (1) Detritivores
 (2) Primary consumers
 (3) Secondary consumers
 (4) Tertiary consumers
96. An association of individuals of different species living in the same habitat and having functional interactions is :
 (1) Population (2) Ecological niche
 (3) Biotic community (4) Ecosystem
97. The oxygen evolved during photosynthesis comes from water molecules. Which one of the following pairs of elements is involved in this reaction?
 (1) Magnesium and Chlorine
 (2) Manganese and Chlorine
 (3) Manganese and Potassium
 (4) Magnesium and Molybdenum
98. Axile placentation is present in :
 (1) *Argemone* (2) *Dianthus*
 (3) Lemon (4) Pea

99. In which of the following both pairs have correct combination ?

(1)	Gaseous nutrient cycle	Sulphur and Phosphorus
	Sedimentary nutrient cycle	Carbon and Nitrogen
(2)	Gaseous nutrient cycle	Carbon and Nitrogen
	Sedimentary nutrient cycle	Sulphur and Phosphorus
(3)	Gaseous nutrient cycle	Carbon and sulphur
	Sedimentary nutrient cycle	Nitrogen and phosphorus
(4)	Gaseous nutrient cycle	Nitrogen and sulphur
	Sedimentary nutrient cycle	Carbon and Phosphorus

100. In mammalian eye, the 'fovea' is the center of the visual field, where :
 (1) more rods than cones are found.
 (2) high density of cones occur, but has no rods
 (3) the optic nerve leaves the eye
 (4) only rods are present
101. Choose the **wrong** statement :
 (1) Yeast is unicellular and useful in fermentation
 (2) *Penicillium* is multicellular and produces antibiotics
 (3) *Neurospora* is used in the study of biochemical genetics
 (4) Morels and truffles are poisonous mushrooms
102. Which of the following are **not** membrane-bound?
 (1) Mesosomes (2) Vacuoles
 (3) Ribosomes (4) Lysosomes
103. In which of the following interactions both partners are adversely affected ?
 (1) Mutualism
 (2) Competition
 (3) Predation
 (4) Parasitism
104. A colour blind man marries a woman with normal sight who has no history of colour blindness in her family. What is the probability of their grandson being colour blind ?
 (1) 0.25 (2) 0.5
 (3) 1 (4) Nil

- 105.** Ectopic pregnancies are referred to as :
- (1) Pregnancies terminated due to hormonal imbalance
 - (2) Pregnancies with genetic abnormality.
 - (3) Implantation of embryo at site other than uterus.
 - (4) Implantation of defective embryo in the uterus
- 106.** Cellular organelles with membranes are :
- (1) Lysosomes, Golgi apparatus and mitochondria
 - (2) Nuclei, ribosomes and mitochondria
 - (3) Chromosomes, ribosomes and endoplasmic reticulum
 - (4) Endoplasmic reticulum, ribosomes and nuclei
- 107.** Cell wall is absent in :
- (1) *Nostoc* (2) *Aspergillus*
 - (3) *Funaria* (4) *Mycoplasma*
- 108.** The term "linkage" was coined by :
- (1) W.Sutton (2) T.H. Morgan
 - (3) T.Boveri (4) G.Mendel
- 109.** Which of the following biomolecules does have a phosphodiester bond ?
- (1) Nucleic acids in a nucleotide
 - (2) Fatty acids in a diglyceride
 - (3) Monosaccharides in a polysaccharide
 - (4) Amino acids in a polypeptide
- 110.** The primary dentition in human differs from permanent dentition in **not** having one of the following type of teeth :
- (1) Incisors (2) Canine
 - (3) Premolars (4) Molars
- 111.** A protoplast is a cell :
- (1) without cell wall
 - (2) without plasma membrane
 - (3) without nucleus
 - (4) undergoing division
- 112.** In which group of organisms the cells walls form two thin overlapping shells which fit together ?
- (1) Slime moulds (2) Chrysophytes
 - (3) Euglenoids (4) Dinoflagellates
- 113.** The DNA molecules to which the gene of interest is integrated for cloning is called :
- (1) Carrier (2) Transformer
 - (3) Vector (4) Template
- 114.** Male gametophyte in angiosperms produces:
- (1) Three sperms
 - (2) Two sperms and a vegetative cell
 - (3) Single sperm and a vegetative cell
 - (4) Single sperm and two vegetative cells
- 115.** Coconut water from a tender coconut is :
- (1) Degenerated nucellus
 - (2) Immature embryo
 - (3) Free nuclear endosperm
 - (4) Innermost layers of the seed coat
- 116.** The species confined to a particular region and not found elsewhere is termed as :
- (1) Rare (2) Keystone
 - (3) Alien (4) Endemic
- 117.** Metagenesis refers to :
- (1) Presence of a segmented body and parthenogenetic mode of reproduction
 - (2) Presence of different morphic forms
 - (3) Alternation of generation between asexual and sexual phases of an organism
 - (4) Occurrence of a drastic change in form during post-embryonic development
- 118.** The enzymes that is **not** present in succus entericus is :
- (1) lipase (2) maltase
 - (3) nucleases (4) nucleosidase
- 119.** Eutrophication of water bodies leading to killing of fishes is mainly due to non-availability of :
- (1) oxygen (2) food
 - (3) light (4) essential minerals
- 120.** The function of the gap junction is to :
- (1) stop substance from leaking across a tissue
 - (2) performing cementing to keep neighbouring cells together
 - (3) Facilitate communication between adjoining cells by connecting the cytoplasm for rapid transfer of ions, small molecules and some large molecules
 - (4) separate two cells from each other.

- 121.** Match the following list of microbes and their importance :

(a)	<i>Saccharomyces cerevisiae</i>	(i)	Production of immunosuppressive agents
(b)	<i>Monascus purpureus</i>	(ii)	Ripening of Swiss cheese
(c)	<i>Trichoderma polysporum</i>	(iii)	Commercial production of ethanol
(d)	<i>Propionibacterium sharmanii</i>	(iv)	Production of blood cholesterol lowering agents

(a)	(b)	(c)	(d)
(1) (iii)	(i)	(iv)	(ii)
(2) (iii)	(iv)	(i)	(ii)
(3) (iv)	(iii)	(ii)	(i)
(4) (iv)	(ii)	(i)	(iii)

- 122.** Arrange the following events of meiosis in correct sequence :

- (a) Crossing over
(b) Synapsis
(c) Terminalisation of chiasmata
(d) Disappearance of nucleolus
- (1) (b), (c), (d), (a) (2) (b), (a), (d), (c)
(3) (b), (a), (c), (d) (4) (a), (b), (c), (d)

- 123.** The cutting of DNA at specific locations became possible with the discovery of :

- (1) Ligases (2) Restriction enzymes
(3) Probes (4) Selectable markers

- 124.** During biological nitrogen fixation, inactivation of nitrogenase by oxygen poisoning is prevented by

- (1) Cytochrome (2) Leghaemoglobin
(3) Xanthophyll (4) Carotene

- 125.** Grafted kidney may be rejected in a patient due to

- (1) Innate immune response
(2) Humoral immune response
(3) Cell-mediated immune response
(4) Passive immune response

- 126.** The body cells in cockroach discharge their nitrogenous waste in the haemolymph mainly in the form of :

- (1) Calcium carbonate (2) Ammonia
(3) Potassium urate (4) Urea

- 127.** Filiform apparatus is characteristic feature of :

- (1) Synergids (2) Generative cell
(3) Nucellar embryo (4) Aleurone cell

- 128.** Acid rain is caused by increase in the atmospheric concentration of :

- (1) O₃ and dust (2) SO₂ and NO₂
(3) SO₃ and CO (4) CO₂ and CO

- 129.** The wheat grain has an embryo with one large, shield-shaped cotyledon known as :

- (1) Coleoptile (2) Epiblast
(3) Coleorrhiza (4) Scutellum

- 130.** Among china rose, mustard, brinjal, potato, guava, cucumber, onion and tulip, how many plants have superior ovary?

- (1) Four (2) Five (3) Six (4) Three

- 131.** Which of the following is **not** a function of the skeletal system?

- (1) Locomotion
(2) Production of erythrocytes
(3) Storage of minerals
(4) Production of body heat

- 132.** Golden rice is a genetically modified crop plant where the incorporated gene is meant for biosynthesis of :

- (1) Vitamin A (2) Vitamin B
(3) Vitamin C (4) Omega 3

- 133.** Chromatophores take part in :

- (1) Respiration (2) Photosynthesis
(3) Growth (4) Movement

- 134.** Select the **wrong** statement :

- (1) Mosaic disease in tobacco and AIDS in human being are caused by viruses
(2) The viroids were discovered by D.J. Ivanowski
(3) W.M. Stanley showed that viruses could be crystallized
(4) The term 'contagium vivum fluidum' was coined by M.W. Beijerinck

- 135.** A pleiotropic gene :

- (1) controls multiple traits in an individual
(2) is expressed only in primitive plants
(3) is a gene evolved during Pliocene
(4) controls a trait only in combination with another gene

- 136.** Human urine is usually acidic because :

- (1) hydrogen ions are actively secreted into the filtrate.
(2) the sodium transporter exchanges one hydrogen ion for each sodium ion, in peritubular capillaries.
(3) excreted plasma proteins are acidic
(4) potassium and sodium exchange generates acidity

- 137.** Auxin can be bioassayed by :
 (1) Lettuce hypocotyl elongation
 (2) Avena coleoptile curvature
 (3) Hydroponics
 (4) Potometer
- 138.** Which of the following events is **not** associated with ovulation in human female?
 (1) LH surge
 (2) Decrease in estradiol
 (3) Full development of Graafian follicle
 (4) Release of secondary oocyte
- 139.** Body having meshwork of cells, internal cavities lined with food filtering flagellated cells and indirect development are the characteristics of phylum :
 (1) Protozoa (2) Coelenterata
 (3) Porifera (4) Mollusca
- 140.** Which one of the following hormones is **not** involved in sugar metabolism ?
 (1) Glucagon (2) Cortisone
 (3) Aldosterone (4) Insulin
- 141.** Which of the following diseases is caused by a protozoan ?
 (1) Blastomycosis (2) Syphilis
 (3) Influenza (4) Babesiosis
- 142.** Outbreeding is an important strategy of animal husbandry because it :
 (1) exposes harmful recessive genes that are eliminated by selection
 (2) helps in accumulation of superior genes.
 (3) is useful in producing purelines of animals.
 (4) is useful in overcoming inbreeding depression
- 143.** A childless couple can be assisted to have a child through a technique called GIFT. The full form of this technique is :
 (1) Germ cell internal fallopian transfer
 (2) Gamete inseminated fallopian transfer
 (3) Gamete intra fallopian transfer
 (4) Gamete internal fertilization and transfer
- 144.** A jawless fish, which lays eggs in fresh water and whose ammocoetes larvae after metamorphosis return to the ocean is :
 (1) *Petromyzon* (2) *Eptatretus*
 (3) *Myxine* (4) *Neomyxine*
- 145.** The structures that help some bacteria to attach to rocks and/or host tissues are :
 (1) Holdfast (2) Rhizoids
 (3) Fimbriae (4) Mesosomes
- 146.** If you suspect major deficiency of antibodies in a person, to which of the following would you look for confirmatory evidence?
 (1) Serum globulins
 (2) Fibrinogen in plasma
 (3) Serum albumins
 (4) Haemocytes
- 147.** In human females, meiosis-II is not completed until?
 (1) birth
 (2) puberty
 (3) fertilization
 (4) uterine implantation
- 148.** Which of the following layers in an antral follicle is acellular ?
 (1) Zona pellucida (2) Granulosa
 (3) Theca interna (4) Stroma
- 149.** In his classic experiments on pea plants, Mendel did not use :
 (1) Flower position (2) Seed colour
 (3) Pod length (4) Seed shape
- 150.** Which one of the following fruits is parthenocarpic?
 (1) Banana (2) Brinjal
 (3) Apple (4) Jackfruit
- 151.** In angiosperms, microsporogenesis and megasporogenesis :
 (1) occur in ovule
 (2) occur in anther
 (3) form gametes without further divisions
 (4) involve meiosis
- 152.** A gene showing codominance has :
 (1) both alleles independently expressed in the heterozygote
 (2) one allele dominant on the other
 (3) alleles tightly linked on the same chromosome
 (4) alleles that are recessive to each other
- 153.** The chitinous exoskeleton of arthropods is formed by the polymerisation of :
 (1) lipoglycans
 (2) keratin sulphate and chondroitin sulphate
 (3) D-glucosamine
 (4) N-acetyl glucosamine
- 154.** The imperfect fungi which are decomposers of litter and help in mineral cycling belong to :
 (1) Ascomycetes
 (2) Deuteromycetes
 (3) Basidiomycetes
 (4) Phycomycetes

155. The wings of a bird and the wings of an insect are :

- (1) homologous structures and represent convergent evolution
- (2) homologous structures and represent divergent evolution
- (3) analogous structures and represent convergent evolution
- (4) phylogenetic structures and represent divergent evolution

156. Flowers are unisexual in :

- (1) Onion
- (2) Pea
- (3) Cucumber
- (4) China rose

157. Increase in concentration of the toxicant at successive trophic levels is known as :

- (1) Biogeochemical cycling
- (2) Biomagnification
- (3) Biodeterioration
- (4) Biotransformation

158. Destruction of the anterior horn cells of the spinal cord would result in loss of :-

- (1) Integrating impulses
- (2) Sensory impulses
- (3) voluntary motor impulses
- (4) Commissural impulses

159. Roots play insignificant role in absorption of water in :

- (1) Wheat
- (2) Sunflower
- (3) *Pistia*
- (4) Pea

160. Match the columns and identify the correct option:

	Column-I		Column-II
(a)	Thylakoids	(i)	Disc-shaped sacs in Golgi apparatus
(b)	Cristae	(ii)	Condensed structure of DNA
(c)	Cisternae	(iii)	Flat membranous sacs in stroma
(d)	Chromatin	(iv)	Infoldings in mitochondria

- | (a) | (b) | (c) | (d) |
|-----------|-------|------|------|
| (1) (iii) | (iv) | (ii) | (i) |
| (2) (iv) | (iii) | (i) | (ii) |
| (3) (iii) | (iv) | (i) | (ii) |
| (4) (iii) | (i) | (iv) | (ii) |

161. Identify the **correct** order of organisation of genetic material from largest to smallest :

- (1) Chromosome, genome, nucleotide, gene
- (2) Chromosome, gene, genome, nucleotide
- (3) Genome, chromosome, nucleotide, gene
- (4) Genome, chromosome, gene, nucleotide

162. Which one of the following hormones though synthesised elsewhere, is stored and released by the master gland ?

- (1) Melanocyte stimulating hormone
- (2) Antidiuretic hormone
- (3) Luteinizing hormone
- (4) Prolactin

163. Read the different components from (a) to (d) in the list given below and tell the correct order of the components with reference to their arrangement from outer side to inner side in a woody dicot stem:

- (a) Secondary cortex
- (b) Wood
- (c) Secondary phloem
- (d) Phellem

The correct order is :

- (1) (d), (c), (a), (b)
- (2) (c), (d), (b), (a)
- (3) (a), (b), (d), (c)
- (4) (d), (a), (c), (b)

164. Which of the following joints would allow no movement ?

- (1) Ball and Socket joint
- (2) Fibrous joint
- (3) Cartilaginous joint
- (4) Synovial joint

165. Which one of the following is **not** applicable to RNA?

- (1) Chargaff's rule
- (2) Complementary base pairing
- (3) 5' phosphoryl and 3' hydroxyl ends
- (4) Heterocyclic nitrogenous bases

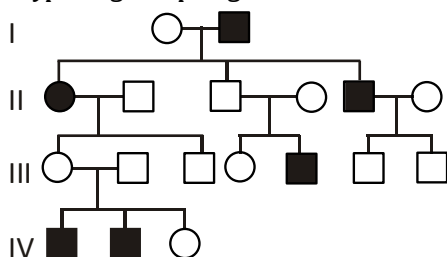
166. Doctors use stethoscope to hear the sound produced during each cardiac cycle. The second sound is heard when :

- (1) AV node receives signal from SA node
- (2) AV valves open up
- (3) Ventricular walls vibrate due to gushing in of blood from atria
- (4) Semilunar valves close down after the blood flows into vessels from ventricles

167. During ecological succession :

- (1) the changes lead to a community that is in near equilibrium with the environment and is called pioneer community
- (2) the gradual and predictable change in species composition occurs in a given area
- (3) the establishment of a new biotic community is very fast in its primary phase
- (4) the numbers and types of animals remain constant

168. In the following human pedigree, the filled symbols represent the affected individuals. Identify the type of given pedigree.



- (1) X-linked dominant
- (2) Autosomal dominant
- (3) X-linked recessive
- (4) Autosomal recessive

169. Balbiani rings are sites of :

- (1) RNA and protein synthesis
- (2) Lipid synthesis
- (3) Nucleotide synthesis
- (4) Polysaccharide synthesis

170. Name the pulmonary disease in which alveolar surface area involved in gas exchange is drastically reduced due to damage in the alveolar walls.

- (1) Asthma
- (2) Pleurisy
- (3) Emphysema
- (4) Pneumonia

171. Which the following are most suitable indicators of SO_2 pollution in the environment?

- (1) Fungi
- (2) Lichens
- (3) Conifers
- (4) Algae

172. Satellite DNA is important because it :

- (1) Codes for enzymes needed for DNA replication
- (2) Codes for proteins needed in cell cycle
- (3) Shows high degree of polymorphism in population and also the same degree of polymorphism in an individual, which is heritable from parents to children
- (4) Does not code for proteins and is same in all members of the population

173. Industrial melanism is an example of :

- (1) Neo Lamarckism
- (2) Neo Darwinism
- (3) Natural selection
- (4) Mutation

174. A column of water within xylem vessels of tall trees does **not** break under its weight because of :

- (1) Positive root pressure
- (2) Dissolved sugars in water
- (3) Tensile strength of water
- (4) Lignification of xylem vessels

175. The introduction of t-DNA into plants involves :

- (1) Allowing the plant roots to stand in water
- (2) Infection of the plant by *Agrobacterium tumefaciens*
- (3) Altering the pH of the soil, then heat shocking the plants
- (4) Exposing the plants to cold for a brief period

176. Pick up the wrong statement :

- (1) Nuclear membrane is present in Monera
- (2) Cell wall is absent in Animalia
- (3) Protista have photosynthetic and heterotrophic modes of nutrition
- (4) Some fungi are edible

177. In photosynthesis, the light-independent reactions take place at :

- (1) Stromal matrix
- (2) Thylakoid lumen
- (3) Photosystem - I
- (4) Photosystem-II

178. Which of the following immunoglobulins does constitute the largest percentage in human milk?

- (1) IgG
- (2) IgD
- (3) IgM
- (4) IgA

179. Which of the following pairs is **not** correctly matched?

	Mode of reproduction	Example
(1)	Conidia	<i>Penicillium</i>
(2)	Offset	Water hyacinth
(3)	Rhizome	Banana
(4)	Binary fission	<i>Sargassum</i>

180. The UN conference of Parties on climate change in the year 2012 was held at :

- (1) Warsaw
- (2) Durban
- (3) Doha
- (4) Lima

ANSWER KEY**RE-AIPMT- 2015**

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	1	2	4	3	3	3	1	4	3	2	3	3	3	1	2
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	2	4	1	1	4	2	2	2	2	4	2	3	3	2	2
Que.	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Ans.	2	3	2	3	2	2	1	1	2	2	3	1	3	2	1
Que.	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ans.	4	1	3	3	3	3	4	3	1	3	3	2	2	3	3
Que.	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Ans.	2	2	2	2	4	3	3	3	4	2	2	1	4	1	2
Que.	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
Ans.	3	4	3	4	2	3	1	4	1	4	4	2	3	2	1
Que.	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105
Ans.	2	3	2	4	1	3	2	3	2	2	4	3	2	2,4	3
Que.	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
Ans.	1	4	2	1	3	1	2	3	2	3	4	3	3	1	3
Que.	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135
Ans.	2	3	2	2	3	3	1	2	4	3	4	1	2	2	1
Que.	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
Ans.	1	2	2	3	3	4	4	3	1	3	1	3	1	3	1
Que.	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165
Ans.	4	1	4	2	3	3	2	3	3	3	4	2	4	2	1
Que.	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
Ans.	4	2	4	1	3	2	3	3	3	2	1	1	4	4	3

HINT - SHEET

1. For Lyman series

$$\left(\frac{1}{\lambda_{\max}}\right)_L = R(1)^2 \left[\frac{1}{(1)^2} - \frac{1}{(2)^2} \right]$$

$$(\lambda_{\max})_L = \frac{4}{3R}$$

For Balmer series

$$\left(\frac{1}{\lambda_{\max}}\right)_B = R(1)^2 \left[\frac{1}{(2)^2} - \frac{1}{(3)^2} \right]$$

$$(\lambda_{\max})_B = \frac{36}{5R}$$

$$\frac{(\lambda_{\max})_L}{(\lambda_{\max})_B} = \frac{4}{3R} \times \frac{5R}{36} = \frac{5}{27}$$

2. Wavelength of the ray

$$\lambda = \frac{hc}{E}$$

$$= 0.826 \text{ \AA}$$

since $\lambda < 100 \text{ \AA}$

so it is X-ray

3. First current develops in direction of abcd but when electron moves away, then magnetic field inside loop decreases & current will change its direction.



$Av = \text{constant}$

$$\pi R^2 V = n\pi r^2 v_1 \Rightarrow v_1 = \frac{VR^2}{nr^2}$$

5. $Y = \frac{F\ell}{A\Delta\ell} \Rightarrow \Delta\ell = \frac{F\ell}{AY}$

$$(\Delta\ell)_{\text{steel}} = (\Delta\ell)_{\text{Brass}}$$

$$\Rightarrow \frac{W_s \ell}{AY_s} = \frac{W_B \ell}{AY_B}$$

$$\Rightarrow \frac{W_s}{W_B} = \frac{Y_s}{Y_B} = 2$$

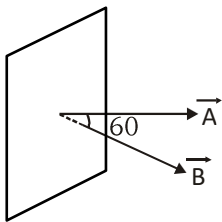
6. Potential gradient $x = \frac{ir}{L} = \frac{E_0}{(r_1 + r)} \frac{r}{L}$
 \therefore e.m.f. $E = x\ell = \frac{E_0 r}{(r + r_1)} \cdot \frac{\ell}{L}$

7. For S.H.M.
 Maximum acceleration $= \omega^2 A = \alpha$
 Maximum velocity $= \omega A = \beta$
 $\Rightarrow \omega = \frac{\alpha}{\beta} \Rightarrow T = \frac{2\pi}{\omega} = \frac{2\pi\beta}{\alpha}$

8. $\vec{A} \cdot \vec{B} = 0$
 $\cos \omega t \cos \frac{\omega t}{2} + \sin \omega t \sin \frac{\omega t}{2} = 0$
 $\cos\left(\omega t - \frac{\omega t}{2}\right) = 0 \Rightarrow \cos \frac{\omega t}{2} = 0$
 $\Rightarrow \frac{\omega t}{2} = \frac{\pi}{2} \Rightarrow t = \frac{\pi}{\omega}$

9. $f_0 = f_s \left(\frac{v}{v - v_s} \right) = 100 \left(\frac{330}{330 - \frac{19.4}{2}} \right) \approx 103 \text{ Hz}$

10. Velocity of the automobile
 $v = 54 \times \frac{5}{18} = 15 \text{ m/s}$
 $\omega_0 = \frac{v}{R} = \frac{15}{0.45} = \frac{100}{3} \text{ rad/s}$
 so angular acceleration
 $\alpha = \frac{\Delta\omega}{t} = \frac{\omega_f - \omega_0}{t} = -\frac{100}{45} \text{ rad/s}^2$
 so Torque $= I\alpha = 3 \times \frac{100}{45} = 6.66 \text{ kg-m}^2\text{s}^{-2}$

11. 
 $\vec{\tau} = \vec{M} \times \vec{B}$
 $|\vec{\tau}| = MB \sin \theta = NIAB \sin \theta = 0.20 \text{ Nm}$

12. $F = \frac{Q^2}{2\epsilon_0 A}$
 $\therefore Q = CV$ and $C = \frac{\epsilon_0 A}{d}$
 $\Rightarrow e_0 A = Cd$
 So $F = \frac{C^2 V^2}{2Cd} = \frac{CV^2}{2d}$

13. According to ideal gas equation

$$P = \frac{\rho RT}{M} \Rightarrow M = \frac{\rho RT}{P}$$

so $\frac{M_A}{M_B} = \frac{\rho_A}{\rho_B} \cdot \frac{T_A}{T_B} \cdot \frac{P_B}{P_A} = (1.5) (1) \left(\frac{1}{2} \right)$
 $\Rightarrow \frac{M_A}{M_B} = \frac{3}{4}$

15. Potential difference on $R = 3.5 - 0.5 = 3.0 \text{ volt}$

Current in circuit $i = \frac{V}{R} = \frac{3}{100} = 30 \text{ mA}$

16. For the satellite revolving around earth

$$v_0 = \sqrt{\frac{GM_e}{(R_e + h)}} = \sqrt{\frac{GM_e}{R_e \left(1 + \frac{h}{R_e} \right)}} = \sqrt{\frac{gR_e}{1 + \frac{h}{R_e}}}$$

substituting the values

$$v_0 = \sqrt{60 \times 10^6} \text{ m/s}$$

$$v_0 = 7.76 \times 10^3 \text{ m/s} = 7.76 \text{ km/s}$$

17. $\vec{R} = 4 \sin(2\pi t) \hat{i} + 4 \cos 2\pi t \hat{j}$

$$\vec{v} = \frac{d\vec{R}}{dt} = 8\pi \cos 2\pi t \hat{i} - 8\pi \sin 2\pi t \hat{j}$$

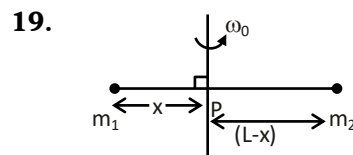
$$|\vec{v}| = 8\pi\sqrt{2}$$

18. Two consecutive resonant frequencies for a string fixed at both ends will be

$$\frac{nv}{2\ell} \text{ and } \frac{(n+1)v}{2\ell} \Rightarrow \frac{(n+1)v}{2\ell} - \frac{nv}{2\ell} = 420 - 315$$

$$\frac{v}{2\ell} = 105 \text{ Hz}$$

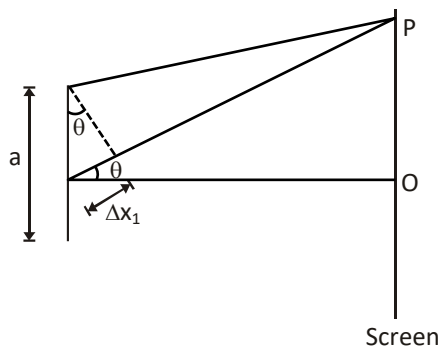
Which is the minimum resonant frequency



The position of point P on rod through which the axis should pass so that the work required to set the rod rotating with minimum angular velocity ω_0 is their centre of mass

$$\text{so } m_1 x = m_2 (L - x) \Rightarrow x = \frac{m_2 L}{m_1 + m_2}$$

20.



For first minima at P, $a \sin \theta = \lambda$

So phase difference

$$\Delta \phi_1 = \frac{\Delta x_1}{\lambda} \times 2\pi = \frac{(a/2) \sin \theta}{\lambda} \times 2\pi$$

$$\Delta \phi_1 = \frac{\lambda}{2\lambda} \times 2\pi = \pi \text{ radian}$$

21. For conservation of angular momentum about origin

$$\sum \vec{\tau}_{\text{net}} = 0 \Rightarrow \vec{r} \times \vec{F} = 0 \Rightarrow \alpha = -1$$

22. For two particles to collide, the direction of the relative velocity of one with respect to other should be directed towards the relative position of the other particle

i.e. $\frac{\vec{r}_1 - \vec{r}_2}{|\vec{r}_1 - \vec{r}_2|} \rightarrow$ direction of relative position of 1

w.r.t. 2.

& $\frac{\vec{v}_2 - \vec{v}_1}{|\vec{v}_2 - \vec{v}_1|} \rightarrow$ direction of velocity of 2 w.r.t. 1

so for collision of A & B

$$\frac{\vec{r}_1 - \vec{r}_2}{|\vec{r}_1 - \vec{r}_2|} = \frac{\vec{v}_2 - \vec{v}_1}{|\vec{v}_2 - \vec{v}_1|}$$

23. By COLM :

$$p_f - p_i = 0$$

$$\Rightarrow p_{\text{He}} - p_{\text{Th}} = 0 \Rightarrow p_{\text{He}} = p_{\text{Th}}$$

but $K \propto \frac{1}{m}$ and $m_{\text{He}} < m_{\text{Th}}$ So $K_{\text{He}} > K_{\text{Th}}$

24.



$$R_{\text{eq}} = R_1 + R_2$$

$$\Rightarrow \frac{2\ell}{\sigma_{\text{eq}} A} = \frac{\ell}{\sigma_1 A} + \frac{\ell}{\sigma_2 A} \Rightarrow \sigma_{\text{eq}} = \frac{2\sigma_1 \sigma_2}{\sigma_1 + \sigma_2}$$

25. Energy of photon (E) = $\frac{12400}{5000} = 2.48 \text{ eV}$

Work function (ϕ_0) = 2.28 eV

According to Einstein equation

$$E = \phi_0 + (\text{K.E.})_{\text{max}}$$

$$\Rightarrow 2.48 = 2.28 + (\text{K.E.})_{\text{max}}$$

$$\Rightarrow (\text{K.E.})_{\text{max}} = 0.20 \text{ eV}$$

For electron $\lambda = \frac{h}{\sqrt{2mE}}$

$$\Rightarrow \lambda \approx 28 \text{ \AA}$$

$$\text{So } \lambda \geq 2.8 \times 10^{-9} \text{ m}$$

26. Molecular mass $M = 4.0 \text{ g}$

$$v_{\text{sound}} = \sqrt{\frac{\gamma RT}{M}} \Rightarrow \gamma = \frac{M v^2}{RT} = 1.6$$

$$\text{So, } C_p = \gamma C_v = 1.6 \times 5.0 = 8.0 \text{ J K}^{-1} \text{ mol}^{-1}$$

27. When capacitor is filled with mica then capacitance C increases so X_C decreases

In case (b) $X_C \downarrow$ so voltage across capacitor decreases. so $V_a > V_b$

28. Coefficient of static friction,

$$\mu_s = \tan 30^\circ = \frac{1}{\sqrt{3}} = 0.6$$

$$a = g \sin 30^\circ - \mu_k g \cos 30^\circ$$

$$S = ut + \frac{1}{2} at^2$$

$$\Rightarrow 4 = \frac{1}{2} \left[\frac{g}{2} - \frac{\mu_k g \sqrt{3}}{2} \right] \times 16$$

$$\Rightarrow \mu_k = 0.5$$

29. $(F_C)_{\text{heavier}} = (F_C)_{\text{lighter}}$

$$\Rightarrow \frac{2mV^2}{(r/2)} = \frac{m(nV)^2}{r}$$

$$\Rightarrow n^2 = 4 \Rightarrow n = 2$$

30. Coefficient of performance of refrigerator

$$\text{COP} = \frac{T_L}{T_H - T_L}$$

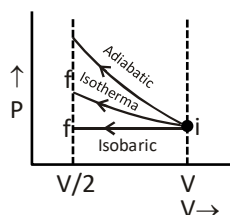
Where $T_L \rightarrow$ lower Temperature

& $T_H \rightarrow$ Higher Temperature

$$\text{So, } 5 = \frac{T_L}{T_H - T_L}$$

$$\Rightarrow T_H = \frac{6}{5} T_L = \frac{6}{5} (253) = 303.6 \text{ K}$$

31.



work done on the gas

$$W_{\text{isochoric}} = 0$$

$$\text{and } W_{\text{adiabatic}} > W_{\text{isothermal}} > W_{\text{isobaric}}$$

32. Let ball rebounds with speed V so

$$v = \sqrt{2gh} = \sqrt{2 \times 10 \times 20} = 20 \text{ m/s}$$

Energy just after rebound

$$E = \frac{1}{2} \times m \times v^2 = 200 \text{ m}$$

50% energy loses in collision means just before collision energy is 400 m

By using energy conservation

$$\frac{1}{2}mv_0^2 + mgh = 400m$$

$$\Rightarrow \frac{1}{2}mv_0^2 + m \times 10 \times 20 = 400m$$

$$\Rightarrow v_0 = 20 \text{ m/s}$$

33. In elastic collision energy of system remains same so.

$$(K.E)_{\text{before collision}} = (K.E)_{\text{After collision}}$$

Let speed of second body after collision is V'

$$\frac{1}{2}mv^2 + 0 = \frac{1}{2}m\left(\frac{v}{3}\right)^2 + \frac{1}{2}m(v')^2$$

$$\Rightarrow v' = \frac{2\sqrt{2}}{3}v$$

34. $\vec{E} = -\frac{\partial V}{\partial x}\hat{i} - \frac{\partial V}{\partial y}\hat{j} - \frac{\partial V}{\partial z}\hat{k}$

$$\vec{E} = -(6y)\hat{i} - (6x - 1 + 2z)\hat{j} - (2y)\hat{k}$$

at point (1,1,0)

$$\vec{E} = -6\hat{i} - 5\hat{j} - 2\hat{k} = -(6\hat{i} + 5\hat{j} + 2\hat{k})$$

35. $\frac{I_1}{I_2} = \frac{W_1}{W_2} = \frac{1}{25} \Rightarrow \frac{I_2}{I_1} = \frac{25}{1}$

$$\frac{I_{\text{max}}}{I_{\text{min}}} = \frac{(\sqrt{I_2} + \sqrt{I_1})^2}{(\sqrt{I_2} - \sqrt{I_1})^2} = \left(\frac{\sqrt{\frac{I_2}{I_1}} + 1}{\sqrt{\frac{I_2}{I_1}} - 1} \right)^2$$

$$= \left(\frac{5 + 1}{5 - 1} \right)^2 = \left(\frac{6}{4} \right)^2 = \frac{9}{4}$$

36. Pressure = 150 mm Hg

$$\text{Pumping rate} = \frac{dV}{dt} = \frac{5 \times 10^{-3}}{60} \text{ m}^3/\text{s}$$

$$\text{Power of heart} = P \cdot \frac{dV}{dt} = \rho gh \times \frac{dV}{dt}$$

$$= (13.6 \times 10^3 \text{ kg/m}^3) (10) \times (0.15) \times \frac{5 \times 10^{-3}}{60}$$

$$= \frac{13.6 \times 5 \times 0.15}{6} = 1.70 \text{ watt}$$

$$37. R = \frac{mv}{q_B} = \frac{\sqrt{2mK}}{q_B}$$

$$\therefore R_\alpha = R_p$$

$$\therefore \frac{4m_\alpha k_a}{q_\alpha^2 B^2} = \frac{4m_p K_p}{q_p^2 B^2}$$

$$\Rightarrow \frac{4m_p k_\alpha}{4e^2} = \frac{m_p (1\text{MeV})}{e^2} \Rightarrow K_\alpha = 1\text{MeV}$$

$$38. \text{ Input signal } v_{in} = 2 \cos(15t + \frac{\pi}{3})$$

$$\text{Voltage Gain} = 150$$

CE amplifier gives phase difference of π between input and output signals

$$A_v = \frac{V_0}{V_{in}} \text{ so } V_0 = A_v V_{in}$$

$$\text{so } V_0 = 150 \times 2 \cos(15t + \frac{\pi}{3} + \pi)$$

$$V_0 = 300 \cos(15t + \frac{4\pi}{3})$$

$$39. v_c \propto [\eta^x \rho^y r^z]$$

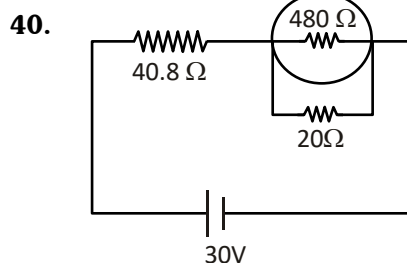
$$[L^1 T^{-1}] \propto [M^1 L^{-1} T^{-1}]^x [M^1 L^{-3}]^y [L^1]^z$$

$$[L^1 T^{-1}] \propto [M^{x+y}] [L^{-x-3y+z}] [T^{-x}]$$

taking comparison on both size

$$x + y = 0, -x - 3y + z = 1, -x = -1$$

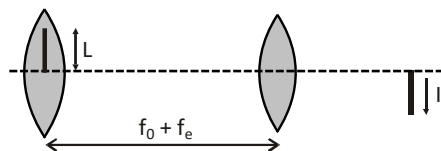
$$\Rightarrow x = 1, y = -1, z = -1$$



$$R_{\text{eff}} = 40.8 + \frac{480 \times 20}{480 + 20} = 40.8 + 19.2 = 60 \Omega$$

$$I = \frac{V_{\text{eff}}}{R_{\text{eff}}} = 0.5 \text{ A}$$

42.



Magnification of telescope,

$$M = \frac{f_o}{f_e}$$

$$\text{Here } \frac{f_e}{f_e + u} = -\frac{I}{L}$$

$$\Rightarrow \frac{f_e}{f_e - (f_o + f_e)} = -\frac{I}{L}$$

$$\Rightarrow \frac{f_e}{f_o} = \frac{I}{L}$$

$$\text{Therefore } M = \frac{L}{I}$$

$$43. d_f = \frac{d_i}{(1 + \gamma \Delta T)}$$

fractional change

$$= \frac{d_i - d_f}{d_i} = 1 - \frac{d_f}{d_i}$$

$$= 1 - (1 + \gamma \Delta T)^{-1}$$

$$= 1 - (1 - \gamma \Delta T)$$

$$\therefore (1+x)^n \approx 1 + nx$$

$$= \gamma \Delta T$$

$$= 5 \times 10^{-4} \times 40$$

$$= 0.020$$

$$44. KE_1 = \frac{hc}{\lambda} - \phi$$

$$KE_2 = \frac{hc}{\lambda/2} - \phi = \frac{2hc}{\lambda} - \phi$$

$$KE_2 = 3KE_1$$

$$\Rightarrow \frac{2hc}{\lambda} - \phi = 3\left(\frac{hc}{\lambda} - \phi\right)$$

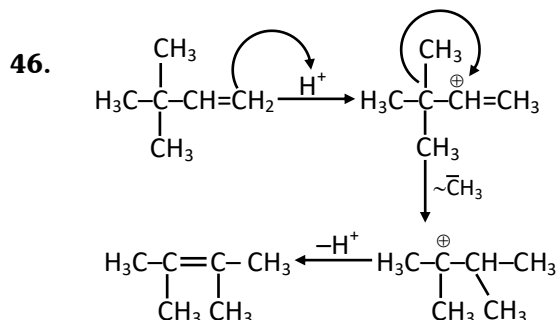
$$\Rightarrow 2\phi = \frac{hc}{\lambda}$$

$$\Rightarrow \phi = \frac{hc}{2\lambda}$$

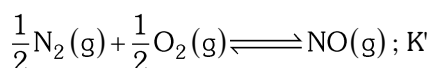
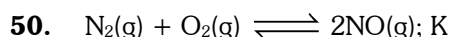
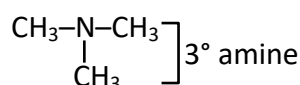
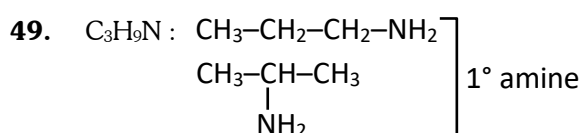
45. $\mu = \frac{1}{\sin i_c} = \frac{1}{\sin 45^\circ} = \sqrt{2} = 1.414$

$\therefore (\mu_{\text{red}} = 1.39) < \mu, \mu_v > \mu; \mu_g > \mu$

only red colour do not suffer total internal reflection.



47. ${}_{64}\text{Gd} = {}_{54}[\text{Xe}]4f^7 5d^1 6s^2$

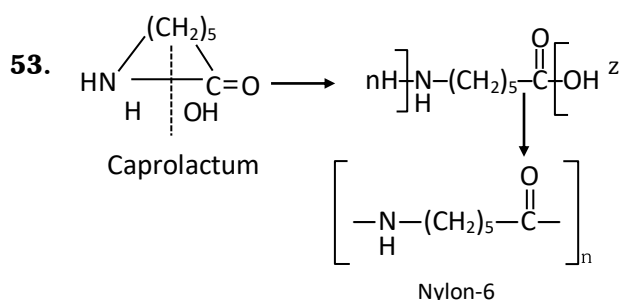


when a reaction is multiplied by $1/2$ then

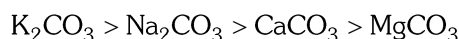
$K' = (K)^{1/2}$

51. HClO_4 and NaClO_4 cannot act as an acidic buffer.

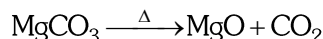
52. Aqueous solution of HCl is the best conductor of electric current because HCl is strong acid, so it dissociates completely into ions.



54. Thermal stability order

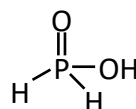


Therefore MgCO_3 releases CO_2 most easily



55. Strong reducing behaviour of H_3PO_2

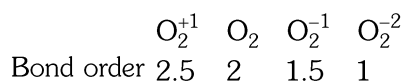
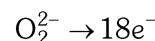
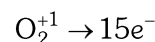
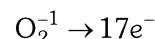
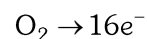
All oxy-acid of phosphorus which contain P-H bond act as reductant.



presence of one -OH group and two P-H bonds

56. Given species : O_2 , O_2^{-1} , O_2^{+1} , O_2^{2-}

Total number of electrons



$\text{Stability} \propto \text{B.O.}$

* Stability order $[\text{O}_2^{+1} > \text{O}_2 > \text{O}_2^{-1} > \text{O}_2^{2-}]$

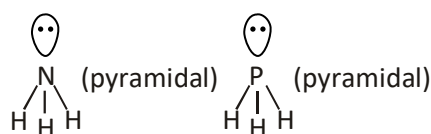
57. $\therefore 1 \text{ mole water} = 6.02 \times 10^{23} \text{ molecules}$

$\therefore 18 \text{ mole water} = 18 \times 6.02 \times 10^{23} \text{ molecules}$

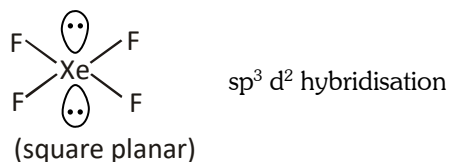
so, 18 mole water has maximum number of molecules.

58. (i) Hybridization of NH_3 [$s=3$, $lp=1$]

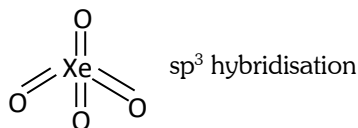
sp^3 geometry : tetrahedral



(ii) Structures of XeF_4 is square planar.

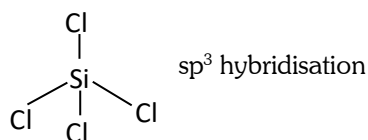


Structure of XeO_4 is tetrahedral

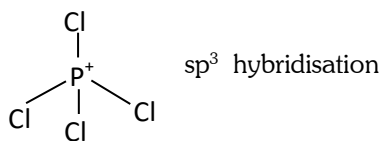


so XeF_4 and XeO_4 are not isostructural

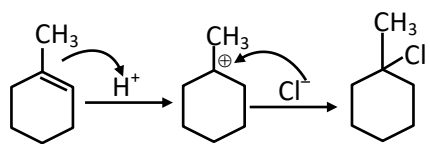
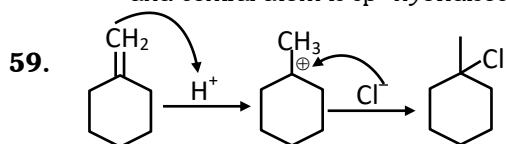
(iii) Structure of SiCl_4 is tetrahedral



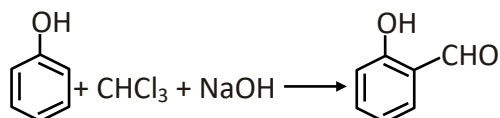
Structure of PCl_4^+ is tetrahedral



(iv) Diamond & SiC both are isostructural because both have tetrahedral arrangement and central atom is sp^3 hybridised.



61. Reimer Tieman reaction



62. Packing efficiency in bcc lattice = 68%

\therefore vacant space in bcc lattice = $100 - 68 = 32\%$

63. (i) No. of electron in $\text{ONF} = 24$

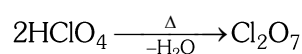
No. of electron in $\text{NO}_2^- = 24$

Both are isoelectronic

(ii) OF_2 is a fluoride of oxygen not oxide of fluorine because EN of fluorine is more than oxygen

OF_2 = oxygen difluoride

(iii) Cl_2O_7 is an anhydride of perchloric acid



(iv) O_3 molecule is bent bent shape

64. $[\text{Fe}(\text{CN})_6]^{3-}$

Hexacyanido ferrate (III) ion

65. \therefore mass of 1 mol (6.022×10^{23} atoms) of carbon = 12g
If Avogadro Number (N_A) is changed

than mass of 1 mol (6.022×10^{20} atom) of carbon

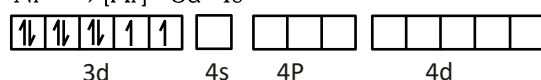
$$= \frac{12 \times 6.022 \times 10^{20}}{6.022 \times 10^{23}} = 12 \times 10^{-3} \text{ g}$$

Therefore the mass of 1 mol of carbon is changed

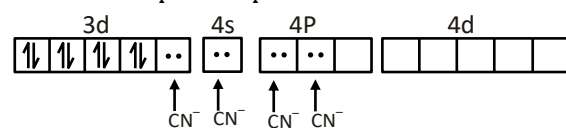
66. Reason : Nucleophiles are electron rich species so act as Lewis base.

67. Real gases show ideal gas behaviour at high temperatures and low pressures.

68. $[\text{Ni}(\text{CN})_4]^{2-}$
oxidation state of Ni is +2
 $x - 4 = 2$
 $x = +2$

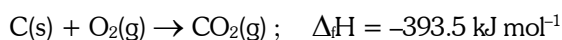


due to presence of strong field ligand all unpaired electrons are paired up.



Hybridisation of $[\text{Ni}(\text{CN})_4]^{2-}$ is dsp^2

69. Formation of CO_2 from carbon and dioxygen gas can be represented as



(1 mole = 44 g)

Heat change on formation of 44 g CO_2

$$= -393.5 \text{ kJ mol}^{-1}$$

$$= \frac{-393.5 \text{ kJ mol}^{-1}}{44 \text{ g}} \times 35.2 \text{ g} = -315 \text{ kJ}$$

Heat released = +315 kJ

70. $\text{MgCO}_3(\text{s}) \rightarrow \text{MgO}(\text{s}) + \text{CO}_2(\text{g})$

$$\text{moles of MgCO}_3 = \frac{20}{84} = 0.238 \text{ mol}$$

From above equation

1 mole MgCO_3 gives 1 mole MgO

\therefore 0.238 mole MgCO_3 will give 0.238 mole MgO

$$= 0.238 \times 40 \text{ g} = 9.523 \text{ g MgO}$$

Practical yield of MgO = 8 g MgO

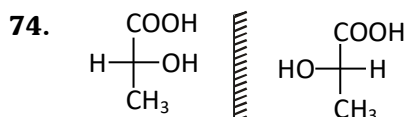
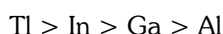
$$\therefore \% \text{ purity} = \frac{8}{9.523} \times 100 = 84\%$$

71. 1.00 m solution means 1 mole solute is present in 1000 g water.

$$n_{\text{H}_2\text{O}} = \frac{1000}{18} = 55.5 \text{ mol H}_2\text{O}$$

$$X_{\text{solute}} = \frac{n_{\text{solute}}}{n_{\text{solute}} + n_{\text{H}_2\text{O}}} = \frac{1}{1 + 55.5} = 0.0177$$

72. Frenkel defect is a dislocation defect
73. Stability of +1 oxidation state due to inert pair effect



Both are enantiomers

75. Benzoylation of aniline is an example of Schotten Baumann reaction.



oxidation state of M = +3

Coordination number of M = 6

Sum of oxidation state + coordination number

$$= 3 + 6 = 9$$

77. Reaction of carbonyl compounds with ammonia derivatives is an example of Nucleophilic addition elimination reaction.

78. EWG (electron withdrawing group) increases reactivity towards nucleophilic substitution reaction. $-\text{NO}_2$ is strong electron withdrawing group.

79. $\text{S}_{\text{N}}1$ reaction gives racemic mixture with slight predominance of that isomer which corresponds to inversion because $\text{S}_{\text{N}}1$ also depends upon the degree of 'shielding' of the front side of the reacting carbon.

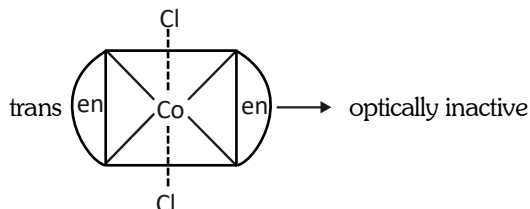
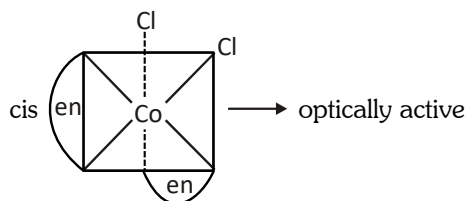
80. For zero order reaction :
 $x = K.t$

$$= 0.6 \times 10^{-3} \times 20 \times 60$$

$$x = 0.72 \text{ M}$$

81. $N_1V_1 - N_2V_2 = N.V.$
 $0.1 \times 1 - 0.01 \times 1 = N \times 2$
 $[\text{OH}^-] = N_{\text{R}} = \frac{0.09}{2} = 0.045 \text{ N}$
 $\text{pOH} = -\log(0.045) = 1.35$
 $\therefore \text{pH} = 14 - \text{pOH} = 14 - 1.35 = 12.65$

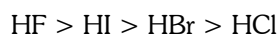
82. $[\text{Co}(\text{en})_2\text{Cl}_2]\text{Cl}$
Possible isomers -
(i) Geometrical isomers



(ii) In trans form plane of symmetry present, so trans form is optically inactive but cis is optically active.

Total number of stereoisomer = $2 + 1 = 3$

- 83.** Due to strong H-bonding in HF molecule, boiling point is highest for HF



- 84.** 16.9 g AgNO_3 is present in 100 mL solution.

\therefore 8.45 g AgNO_3 is present in 50 mL solution

5.8 g NaCl is present in 100 mL solution

\therefore 2.9 g NaCl is present in 50 mL solution



$$\frac{8.45}{170} \text{ mol} \quad \frac{2.9}{58.5}$$

$$= 0.049 \text{ mol} \quad = 0.049 \text{ mol} \rightarrow 0 \quad 0$$

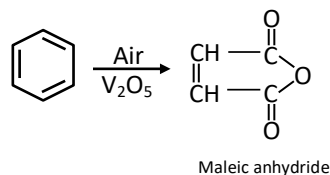
$$\text{after reaction} \quad 0 \quad 0 \rightarrow 0.049 \text{ mol} \quad 0.049 \text{ mol}$$

mass of AgCl precipitated

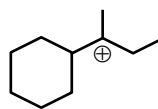
$$= 0.049 \times 143.5 \text{ g}$$

$$= 7 \text{ g AgCl}$$

85.



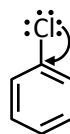
86.



Intermediate carbocation (more stable).
No rearrangement in C^+ takes place.

So product is not possible.

87.



due to resonance C-Cl bond acquires double bond character.

88.

(I) and (IV) can be used due to presence of anhydrous ZnCl_2 (III) gives alkyl halide due to formation of more stable carbocation.

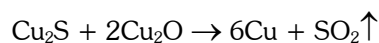
89.

$$\text{Ti}(22) = 1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^2$$

order of energy is 3s 3p 4s 3d

90.

Self reduction

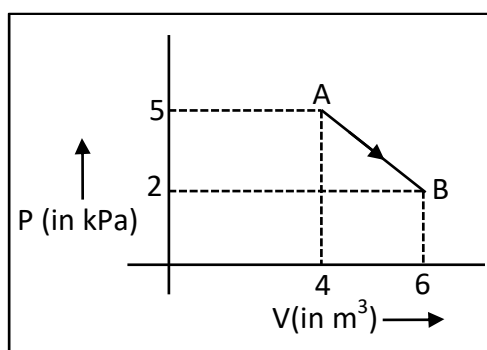


AIPMT - 2015

1. An electron moving in a circular orbit of radius r makes n rotations per second. The magnetic field produced at the centre has magnitude :

- (1) Zero (2) $\frac{\mu_0 n^2 e}{r}$
(3) $\frac{\mu_0 n e}{2r}$ (4) $\frac{\mu_0 n e}{2\pi r}$

2. One mole of an ideal diatomic gas undergoes a transition from A to B along a path AB as shown in the figure,



The change in internal energy of the gas during the transition is :

- (1) -20 kJ (2) 20 J (3) -12 kJ (4) 20 kJ

3. When two displacements represented by $y_1 = a \sin(\omega t)$ and $y_2 = b \cos(\omega t)$ are superimposed the motion is :

- (1) simple harmonic with amplitude $\frac{a}{b}$
(2) simple harmonic with amplitude $\sqrt{a^2 + b^2}$
(3) simple harmonic with amplitude $\frac{(a+b)}{2}$
(4) not a simple harmonic

4. A particle of unit mass undergoes one-dimensional motion such that its velocity varies according to

$$v(x) = \beta x^{-2n}$$

where β and n are constants and x is the position of the particle. The acceleration of the particle as a function of x , is given by :

- (1) $-2n\beta^2 x^{-4n-1}$ (2) $-2\beta^2 x^{-2n+1}$
(3) $-2n\beta^2 e^{-4n+1}$ (4) $-2n\beta^2 x^{-2n-1}$

5. If radius of $^{27}_{13}\text{Al}$ the nucleus is taken to be R_{Al} then the radius of $^{125}_{53}\text{Te}$ nucleus is nearly :

- (1) $\frac{5}{3} R_{\text{Al}}$ (2) $\frac{3}{5} R_{\text{Al}}$
(3) $\left(\frac{13}{53}\right)^{1/3} R_{\text{Al}}$ (4) $\left(\frac{53}{13}\right)^{1/3} R_{\text{Al}}$

6. In a double slit experiment, the two slits are 1 mm apart and the screen is placed 1 m away. A monochromatic light of wavelength 500 nm is used. What will be the width of each slit for obtaining ten maxima of double slit within the central maxima of single slit pattern ?

- (1) 0.1 mm (2) 0.5 mm
(3) 0.02 mm (4) 0.2 mm

7. For a parallel beam of monochromatic light of wavelength ' λ ', diffraction is produced by a single slit whose width ' a ' is of the order of the wavelength of the light. If ' D ' is the distance of the screen from the slit, the width of the central maxima will be :

- (1) $\frac{D\lambda}{a}$ (2) $\frac{Da}{\lambda}$
(3) $\frac{2Da}{\lambda}$ (4) $\frac{2D\lambda}{a}$

8. Across a metallic conductor of non-uniform cross section a constant potential difference is applied. The quantity which remains constant along the conductor is :

- (1) current (2) drift velocity
(3) electric field (4) current density

9. On observing light from three different stars P, Q and R, it was found that intensity of violet color is maximum in the spectrum of P, the intensity of green colour is maximum in the spectrum of R and the intensity of red colour is maximum in the spectrum of Q. If T_P , T_Q and T_R are the respective absolute temperatures of P, Q and R, then it can be concluded from the above observation that :

- (1) $T_P > T_R > T_Q$ (2) $T_P < T_R < T_Q$
(3) $T_P < T_Q < T_R$ (4) $T_P > T_Q > T_R$

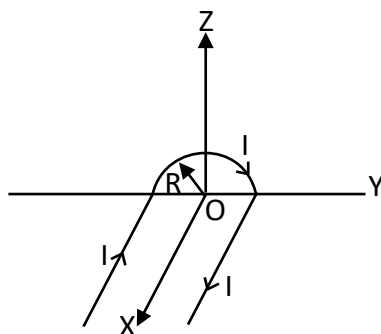
10. A potentiometer wire has length 4 m and resistance 8Ω . The resistance that must be connected in series with the wire and an accumulator of e.m.f. 2V, so as to get a potential gradient 1 mV per cm on the wire is :

(1) 40Ω
 (2) 44Ω
 (3) 48Ω
 (4) 32Ω

11. Consider 3rd orbit of He^+ (Helium), using non-relativistic approach, the speed of electron in this orbit will be [given $K = 9 \times 10^9$ constant, $Z = 2$ and h (Planck's Constant) = 6.6×10^{-34} J s]

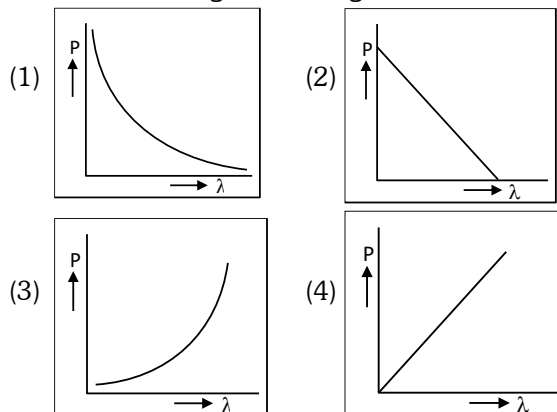
(1) 1.46×10^6 m/s
 (2) 0.73×10^6 m/s
 (3) 3.0×10^8 m/s
 (4) 2.92×10^6 m/s

12. A wire carrying current I has the shape as shown in adjoining figure. Linear parts of the wire are very long and parallel to X-axis while semicircular portion of radius R is lying in Y-Z plane. Magnetic field at point O is :



- (1) $\vec{B} = -\frac{\mu_0 I}{4\pi R}(\pi\hat{i} - 2\hat{k})$
 (2) $\vec{B} = -\frac{\mu_0 I}{4\pi R}(\pi\hat{i} + 2\hat{k})$
 (3) $\vec{B} = \frac{\mu_0 I}{4\pi R}(\pi\hat{i} - 2\hat{k})$
 (4) $\vec{B} = \frac{\mu_0 I}{4\pi R}(\pi\hat{i} + 2\hat{k})$

13. Which of the following figures represent the variation of particle momentum and the associated de-Broglie wavelength ?



14. A parallel plate air capacitor of capacitance C is connected to a cell of emf V and then disconnected from it. A dielectric slab of dielectric constant K , which can just fill the air gap of the capacitor, is now inserted in it. Which of the following is **incorrect** ?

- (1) The energy stored in the capacitor decreases K times.
 (2) The change in energy stored is $\frac{1}{2}CV^2\left(\frac{1}{K}-1\right)$.
 (3) The charge on the capacitor is not conserved.
 (4) The potential difference between the plates decreases K times.

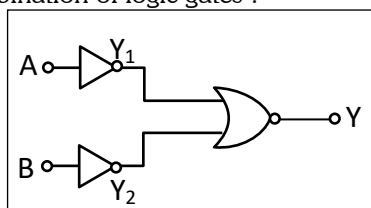
15. The fundamental frequency of a closed organ pipe of length 20 cm is equal to the second overtone of an organ pipe open at both the ends. The length of organ pipe open at both the ends is :-

(1) 100 cm (2) 120 cm
 (3) 140 cm (4) 80 cm

16. The refracting angle of a prism is A , and refractive index of the material of the prism is $\cot(A/2)$. The angle of minimum deviation is :-

(1) $180^\circ - 2A$
 (2) $90^\circ - A$
 (3) $180^\circ + 2A$
 (4) $180^\circ - 3A$

17. Which logic gate is represented by the following combination of logic gates ?



- (1) NAND (2) AND
(3) NOR (4) OR
18. A Carnot engine, having an efficiency of $\eta = \frac{1}{10}$

as heat engine, is used as a refrigerator. If the work done on the system is 10 J, the amount of energy absorbed from the reservoir at lower temperature is :-

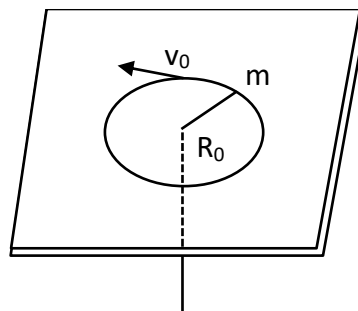
- (1) 99 J (2) 90 J
(3) 1 J (4) 100 J
19. A certain metallic surface is illuminated with monochromatic light of wavelength, λ . The stopping potential for photo-electric current for this light is $3V_0$. If the same surface is illuminated with light of wavelength 2λ , the stopping potential is V_0 . The threshold wavelength for this surface for photoelectric effect is :-

- (1) 4λ (2) $\frac{\lambda}{4}$
(3) $\frac{\lambda}{6}$ (4) 6λ

20. A radiation of energy 'E' falls normally on a perfectly reflecting surface. The momentum transferred to the surface is (C = Velocity of light):-

- (1) $\frac{2E}{C}$ (2) $\frac{2E}{C^2}$
(3) $\frac{E}{C^2}$ (4) $\frac{E}{C}$

21. A mass m moves in a circle on a smooth horizontal plane with velocity v_0 at a radius R_0 . The mass is attached to a string which passes through a smooth hole in the plane as shown.



The tension in the string is increased gradually and finally m moves in a circle of radius $\frac{R_0}{2}$. The final value of the kinetic energy is :-

- (1) $\frac{1}{4}mv_0^2$ (2) $2mv_0^2$
(3) $\frac{1}{2}mv_0^2$ (4) mv_0^2
22. Two identical thin plano-convex glass lenses (refractive index 1.5) each having radius of curvature of 20 cm are placed with their convex surfaces in contact at the centre. The intervening space is filled with oil of refractive index 1.7. The focal length of the combination is :-
- (1) -25 cm (2) -50 cm
(3) 50 cm (4) -20 cm
23. A block A of mass m_1 rests on a horizontal table. A light string connected to it passes over a frictionless pulley at the edge of table and from its other end another block B of mass m_2 is suspended. The coefficient of kinetic friction between the block and the table is μ_k . When the block A is sliding on the table, the tension in the string is :-

- (1) $\frac{(m_2 - \mu_k m_1)g}{(m_1 + m_2)}$ (2) $\frac{m_1 m_2 (1 + \mu_k)g}{(m_1 + m_2)}$
(3) $\frac{m_1 m_2 (1 - \mu_k)g}{(m_1 + m_2)}$ (4) $\frac{(m_2 + \mu_k m_1)g}{(m_1 + m_2)}$

- 24.** A particle is executing SHM along a straight line. Its velocities at distances x_1 and x_2 from the mean position are V_1 and V_2 , respectively. Its time period is :-

(1) $2\pi \sqrt{\frac{x_2^2 - x_1^2}{V_1^2 - V_2^2}}$

(2) $2\pi \sqrt{\frac{V_1^2 + V_2^2}{x_1^2 + x_2^2}}$

(3) $2\pi \sqrt{\frac{V_1^2 - V_2^2}{x_1^2 - x_2^2}}$

(4) $2\pi \sqrt{\frac{x_1^2 + x_2^2}{V_1^2 + V_2^2}}$

- 25.** A ship A is moving Westwards with a speed of 10 km h^{-1} and a ship B 100 km South of A, is moving Northwards with a speed of 10 km h^{-1} . The time after which the distance between them becomes shortest, is :-

(1) 5 h (2) $5\sqrt{2} \text{ h}$

(3) $10\sqrt{2} \text{ h}$ (4) 0 h

- 26.** A rod of weight W is supported by two parallel knife edges A and B and is in equilibrium in a horizontal position. The knives are at a distance d from each other. The centre of mass of the rod is at distance x from A. The normal reaction on A is :-

(1) $\frac{Wd}{x}$ (2) $\frac{W(d-x)}{x}$

(3) $\frac{W(d-x)}{d}$ (4) $\frac{Wx}{d}$

- 27.** The approximate depth of an ocean is 2700 m . The compressibility of water is $45.4 \times 10^{-11} \text{ Pa}^{-1}$ and density of water is 10^3 kg/m^3 . What fractional compression of water will be obtained at the bottom of the ocean ?

(1) 1.0×10^{-2} (2) 1.2×10^{-2}

(3) 1.4×10^{-2} (4) 0.8×10^{-2}

- 28.** Two particles of masses m_1, m_2 move with initial velocities u_1 and u_2 . On collision, one of the particles get excited to higher level, after absorbing energy ϵ . If final velocities of particles be v_1 and v_2 then we must have :

(1) $\frac{1}{2}m_1u_1^2 + \frac{1}{2}m_2u_2^2 = \frac{1}{2}m_1v_1^2 + \frac{1}{2}m_2v_2^2 - \epsilon$

(2) $\frac{1}{2}m_1u_1^2 + \frac{1}{2}m_2u_2^2 - \epsilon = \frac{1}{2}m_1v_1^2 + \frac{1}{2}m_2v_2^2$

(3) $\frac{1}{2}m_1^2u_1^2 + \frac{1}{2}m_2^2u_2^2 + \epsilon = \frac{1}{2}m_1^2v_1^2 + \frac{1}{2}m_2^2v_2^2$

(4) $m_1^2u_1 + m_2^2u_2 - \epsilon = m_1^2v_1 + m_2^2v_2$

- 29.** Kepler's third law states that square of period of revolution (T) of a planet around the sun, is proportional to third power of average distance r between sun and planet

i.e. $T^2 = Kr^3$

here K is constant.

If the masses of sun and planet are M and m respectively then as per Newton's law of gravitation force of attraction between them is

$F = \frac{GMm}{r^2}$, here G is gravitational constant.

The relation between G and K is described as :

(1) $GMK = 4\pi^2$ (2) $K = G$

(3) $K = \frac{1}{G}$ (4) $GK = 4\pi^2$

- 30.** A block of mass 10 kg , moving in x direction with a constant speed of 10 ms^{-1} , is subjected to a retarding force $F = 0.1 \times J/m$ during its travel from $x = 20 \text{ m}$ to 30 m . Its final KE will be :

(1) 450 J (2) 275 J

(3) 250 J (4) 475 J

31. A wind with speed 40 m/s blows parallel to the roof of a house. The area of the roof is 250 m^2 . Assuming that the pressure inside the house is atmospheric pressure, the force exerted by the wind on the roof and the direction of the force will be :

$$(\rho_{\text{air}} = 1.2 \text{ kg/m}^3)$$

- (1) $4.8 \times 10^5 \text{ N}$, upwards
(2) $2.4 \times 10^5 \text{ N}$, upwards
(3) $2.4 \times 10^5 \text{ N}$, downwards
(4) $4.8 \times 10^5 \text{ N}$, downwards
32. Two spherical bodies of mass M and $5M$ and radii R and $2R$ are released in free space with initial separation between their centres equal to $12R$. If they attract each other due to gravitational force only, then the distance covered by the smaller body before collision is :

- (1) $4.5R$ (2) $7.5R$
(3) $1.5R$ (4) $2.5R$

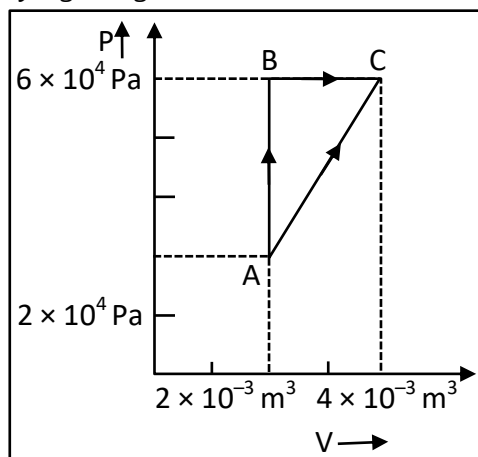
33. A resistance ' R ' draws power ' P ' when connected to an AC source. If an inductance is now placed in series with the resistance, such that the impedance of the circuit becomes ' Z ', the power drawn will be:

- (1) $P\sqrt{\frac{R}{Z}}$ (2) $P\left(\frac{R}{Z}\right)$
(3) P (4) $P\left(\frac{R}{Z}\right)^2$

34. The ratio of the specific heats $\frac{C_p}{C_v} = \gamma$ in terms of degrees of freedom (n) is given by :

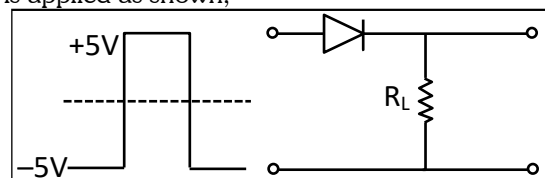
- (1) $\left(1 + \frac{n}{3}\right)$ (2) $\left(1 + \frac{2}{n}\right)$
(3) $\left(1 + \frac{n}{2}\right)$ (4) $\left(1 + \frac{1}{n}\right)$

35. Figure below shows two paths that may be taken by a gas to go from a state A to a state C.



In process AB, 400 J of heat is added to the system and in process BC, 100 J of heat is added to the system. The heat absorbed by the system in the process AC will be :

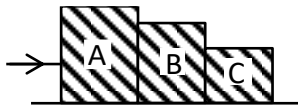
- (1) 500 J (2) 460 J
(3) 300 J (4) 380 J
36. If energy (E), velocity (V) and time (T) are chosen as the fundamental quantities, the dimensional formula of surface tension will be :
- (1) $[E V^{-1} T^{-2}]$ (2) $[E V^{-2} T^{-2}]$
(3) $[E^{-2} V^{-1} T^{-3}]$ (4) $[E V^{-2} T^{-1}]$
37. If in a p-n junction, a square input signal of 10 V is applied as shown,



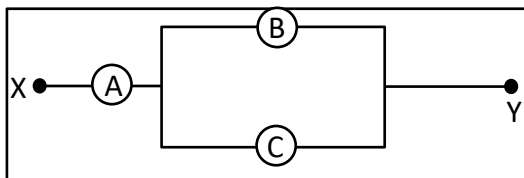
then the output across R_L will be :

- (1)
- (2)
- (3)
- (4)

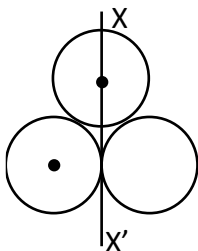
38. Three blocks A, B and C of masses 4 kg, 2 kg and 1 kg respectively, are in contact on a frictionless surface, as shown. If a force of 14 N is applied on the 4 kg block, then the contact force between A and B is :



- (1) 6 N (2) 8 N
(3) 18 N (4) 2 N
39. A, B and C are voltmeters of resistance R , $1.5 R$ and $3R$ respectively as shown in the figure. When some potential difference is applied between X and Y, the voltmeter readings are V_A , V_B and V_C respectively. Then :



- (1) $V_A \neq V_B = V_C$ (2) $V_A = V_B \neq V_C$
(3) $V_A \neq V_B \neq V_C$ (4) $V_A = V_B = V_C$
40. Three identical spherical shells, each of mass m and radius r are placed as shown in figure. Consider an axis XX' which is touching to two shells and passing through diameter of third shell. Moment of inertia of the system consisting of these three spherical shells about XX' axis is :-



- (1) $3mr^2$ (2) $\frac{16}{5}mr^2$
(3) $4mr^2$ (4) $\frac{11}{5}mr^2$
41. The electric field in a certain region is acting radially outward and is given by $E = Ar$. A charge contained in a sphere of radius 'a' centred at the origin of the field, will be given by :
- (1) $A \epsilon_0 a^2$ (2) $4 \pi \epsilon_0 Aa^3$
(3) $\epsilon_0 Aa^3$ (4) $4 \pi \epsilon_0 Aa^2$

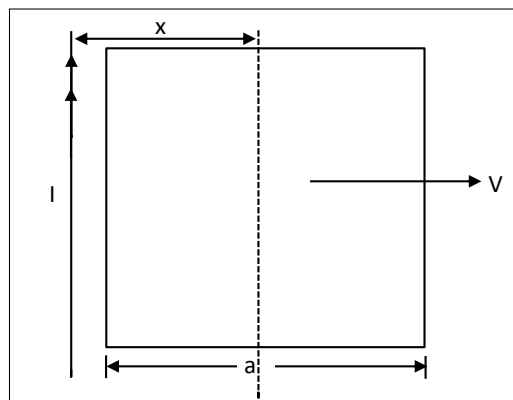
42. The two ends of a metal rod are maintained at temperatures 100°C and 110°C . The rate of heat flow in the rod is found to be 4.0 J/s . If the ends are maintained at temperatures 200°C and 210°C , the rate of heat flow will be :

- (1) 16.8 J/s (2) 8.0 J/s
(3) 4.0 J/s (4) 44.0 J/s

43. Two similar springs P and Q have spring constants K_P and K_Q , such that $K_P > K_Q$. They are stretched, first by the same amount (case a), then by the same force (case b). The work done by the springs W_P and W_Q are related as, in case (a) and case (b), respectively :

- (1) $W_P = W_Q$; $W_P = W_Q$
(2) $W_P > W_Q$; $W_Q > W_P$
(3) $W_P < W_Q$; $W_Q < W_P$
(4) $W_P = W_Q$; $W_P > W_Q$


44. A conducting square frame of side 'a' and a long straight wire carrying current I are located in the same plane as shown in the figure. The frame moves to the right with a constant velocity ' V '. The emf induced in the frame will be proportional to :

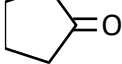


- (1) $\frac{1}{(2x-a)^2}$ (2) $\frac{1}{(2x+a)^2}$
(3) $\frac{1}{(2x-a)(2x+a)}$ (4) $\frac{1}{x^2}$

45. A particle of mass m is driven by a machine that delivers a constant power k watts. If the particle starts from rest the force on the particle at time t is

- (1) $\sqrt{mk} t^{-1/2}$ (2) $\sqrt{2mk} t^{-1/2}$
(3) $\frac{1}{2} \sqrt{mk} t^{-1/2}$ (4) $\sqrt{\frac{mk}{2}} t^{-1/2}$

46. The reaction of $\text{C}_6\text{H}_5\text{CH}=\text{CHCH}_3$ with HBr produces:-
 (1) $\text{C}_6\text{H}_5\text{CH}_2\text{CH}(\text{Br})\text{CH}_3$
 (2) $\text{C}_6\text{H}_5\text{CH}_2\text{CH}_2\text{CH}_2\text{Br}$
 (3) 
 (4) $\text{C}_6\text{H}_5\text{CH}(\text{Br})\text{CH}_2\text{CH}_3$
47. In Duma's method for estimation of nitrogen, 0.25 g of an organic compound gave 40 mL of nitrogen collected at 300 K temperature and 725 mm pressure. If the aqueous tension at 300 K is 25 mm, the percentage of nitrogen in the compound is :-
 (1) 18.20 (2) 16.76
 (3) 15.76 (4) 17.36
48. The K_{sp} of Ag_2CrO_4 , AgCl , AgBr and AgI are respectively, 1.1×10^{-12} , 1.8×10^{-10} , 5.0×10^{-13} , 8.3×10^{-17} . Which one of the following salts will precipitate last if AgNO_3 solution is added to the solution containing equal moles of NaCl , NaBr , NaI and Na_2CrO_4 ?
 (1) AgCl (2) AgBr
 (3) Ag_2CrO_4 (4) AgI
49. Bithionol is generally added to the soaps as an additive to function as a/an :-
 (1) Dryer (2) Buffering agent
 (3) Antiseptic (4) Softner
50. "Metals are usually not found as nitrates in their ores".
 Out of the following two (a and b) reasons which is/are true for the above observation ?
 (a) Metal nitrates are highly unstable.
 (b) Metal nitrates are highly soluble in water.
 (1) a and b are false
 (2) a is false but b is true
 (3) a is true but b is false
 (4) a and b are true
51. The correct bond order in the following species is:-
 (1) $\text{O}_2^{2+} < \text{O}_2^- < \text{O}_2^+$
 (2) $\text{O}_2^+ < \text{O}_2^- < \text{O}_2^{2+}$
 (3) $\text{O}_2^- < \text{O}_2^+ < \text{O}_2^{2+}$
 (4) $\text{O}_2^{2+} < \text{O}_2^+ < \text{O}_2^-$
52. The species Ar , K^+ and Ca^{2+} contain the same number of electrons. In which order do their radii increase ?
 (1) $\text{Ca}^{2+} < \text{Ar} < \text{K}^+$
 (2) $\text{Ca}^{2+} < \text{K}^+ < \text{Ar}$
 (3) $\text{K}^+ < \text{Ar} < \text{Ca}^{2+}$
 (4) $\text{Ar} < \text{K}^+ < \text{Ca}^{2+}$
53. The activation energy of a reaction can be determined from the slope of which of the following graphs ?
 (1) $\frac{\ln K}{T}$ vs. T (2) $\ln K$ vs. $\frac{1}{T}$
 (3) $\frac{T}{\ln K}$ vs. $\frac{1}{T}$ (4) $\ln K$ vs. T
54. Which of the following pairs of ions are isoelectronic and isostructural ?
 (1) ClO_3^- , CO_3^{2-} (2) SO_3^{2-} , NO_3^-
 (3) ClO_3^- , SO_3^{2-} (4) CO_3^{2-} , SO_3^{2-}
55. An organic compound 'X' having molecular formula $\text{C}_5\text{H}_{10}\text{O}$ yields phenyl hydrazone and gives negative response to the Iodoform test and Tollen's test. It produces n-pentane on reduction. 'X' could be :-
 (1) 2-pentanone (2) 3-pentanone
 (3) n-amyl alcohol (4) pentanal
56. Which of the following options represents the correct bond order ?
 (1) $\text{O}_2^- < \text{O}_2 < \text{O}_2^+$
 (2) $\text{O}_2^- > \text{O}_2 < \text{O}_2^+$
 (3) $\text{O}_2^- < \text{O}_2 > \text{O}_2^+$
 (4) $\text{O}_2^- > \text{O}_2 > \text{O}_2^+$

57. Treatment of cyclopentanone  with methyl lithium gives which of the following species?

- (1) Cyclopentanonyl cation
- (2) Cyclopentanonyl radical
- (3) Cyclopentanonyl biradical
- (4) Cyclopentanonyl anion

58. The electrolytic reduction of nitrobenzene in strongly acidic medium produces :-

- (1) Azoxybenzene
- (2) Azobenzene
- (3) Aniline
- (4) p-Aminophenol

59. Magnetic moment 2.84 B.M. is given by :-

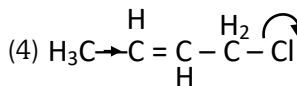
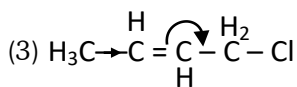
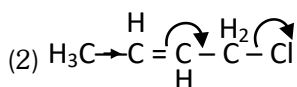
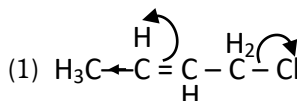
(At. no.), Ni = 28, Ti = 22, Cr = 24, Co = 27)

- (1) Ti^{3+}
- (2) Cr^{2+}
- (3) Co^{2+}
- (4) Ni^{2+}

60. A given metal crystallizes out with a cubic structure having edge length of 361 pm. If there are four metal atoms in one unit cell, what is the radius of one atom?

- (1) 127 pm
- (2) 80 pm
- (3) 108 pm
- (4) 40 pm

61. Which of the following is the most **correct** electron displacement for a nucleophilic reaction to take place ?



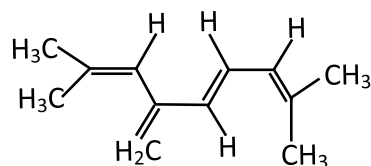
62. Which one of the following electrolytes has the same value of van't Hoff's factor (i) as that of the $Al_2(SO_4)_3$ (if all are 100% ionised) ?

- (1) $K_3[Fe(CN)_6]$
- (2) $Al(NO_3)_3$
- (3) $K_4[Fe(CN)_6]$
- (4) K_2SO_4

63. Nitrogen dioxide and sulphur dioxide have some properties in common. Which property is shown by one of these compounds, but not by the other?

- (1) is a reducing agent
- (2) is soluble in water
- (3) is used as a food-preservative
- (4) forms 'acid-rain'

64. The total number of π -bond electrons in the following structure is :-



- (1) 8
- (2) 12
- (3) 16
- (4) 4

65. Solubility of the alkaline earth's metal sulphates in water decreases in the sequence :-

- (1) $Ca > Sr > Ba > Mg$
- (2) $Sr > Ca > Mg > Ba$
- (3) $Ba > Mg > Sr > Ca$
- (4) $Mg > Ca > Sr > Ba$

66. Maximum bond angle at nitrogen is present in which of the following ?

- (1) NO_2^-
- (2) NO_2^+
- (3) NO_3^-
- (4) NO_2

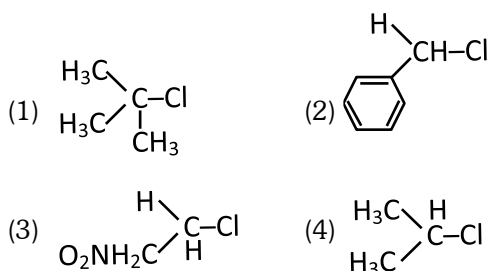
67. If the value of an equilibrium constant for a particular reaction is 1.6×10^{12} , then at equilibrium the system will contain :-

- (1) mostly reactants
- (2) mostly products
- (3) similar amounts of reactants and products
- (4) all reactants

68. The number of d-electrons in Fe^{2+} ($Z = 26$) is not equal to the number of electrons in which one of the following?

- (1) p-electrons in Cl ($Z = 17$)
- (2) d-electrons in Fe ($Z = 26$)
- (3) p-electrons in Ne ($Z = 10$)
- (4) s-electrons in Mg ($Z = 12$)

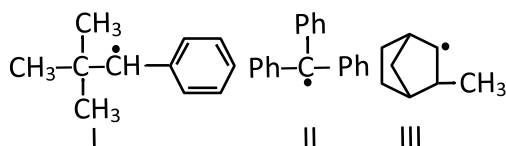
69. In which of the following compounds, the C-Cl bond ionisation shall give most stable carbonium ion?



70. A device that converts energy of combustion of fuels like hydrogen and methane, directly into electrical energy is known as :-

- (1) Electrolytic cell (2) Dynamo
(3) Ni-Cd cell (4) Fuel Cell

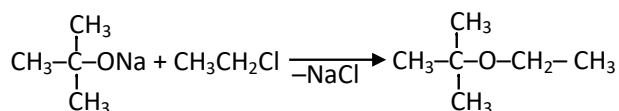
71. Consider the following compounds



Hyperconjugation occurs in :-

- (1) II only (2) III only (3) I and III (4) I only

72. The reaction,



is called :-

- (1) Williamson continuous etherification process
(2) Etard reaction
(3) Gatterman - Koch reaction
(4) Williamson Synthesis

73. Cobalt (III) chloride forms several octahedral complexes with ammonia. Which of the following will not give test of chloride ions with silver nitrate at 25°C ?

- (1) $\text{CoCl}_3 \cdot 4\text{NH}_3$ (2) $\text{CoCl}_3 \cdot 5\text{NH}_3$
(3) $\text{CoCl}_3 \cdot 6\text{NH}_3$ (4) $\text{CoCl}_3 \cdot 3\text{NH}_3$

74. A mixture of gases contains H_2 and O_2 gases in the ratio of 1 : 4 (w/w). What is the molar ratio of the two gases in the mixture ?

- (1) 4 : 1 (2) 16 : 1 (3) 2 : 1 (4) 1 : 4

75. Which of the following processes does not involve oxidation of iron ?

- (1) Decolourization of blue CuSO_4 solution by iron
(2) Formation of $\text{Fe}(\text{CO})_5$ from Fe
(3) Liberation of H_2 from steam by iron at high temperature
(4) Rusting of iron sheets

76. Because of lanthanoid contraction, which of the following pairs of elements have nearly same atomic radii ? (Numbers in the parenthesis are atomic numbers).

- (1) Zr (40) and Nb (41) (2) Zr (40) and Hf (72)
(3) Zr (40) and Ta (73) (4) Ti (22) and Zr (40)

77. Which of the following statements is **correct** for a reversible process in a state of equilibrium ?

- (1) $\Delta G = 2.30 RT \log K$
(2) $\Delta G^\circ = -2.30 RT \log K$
(3) $\Delta G^\circ = 2.30 RT \log K$
(4) $\Delta G = -2.30 RT \log K$

78. The angular momentum of electron in 'd' orbital is equal to :-

- (1) $\sqrt{2} \hbar$ (2) $2\sqrt{3} \hbar$
(3) $0 \hbar$ (4) $\sqrt{6} \hbar$

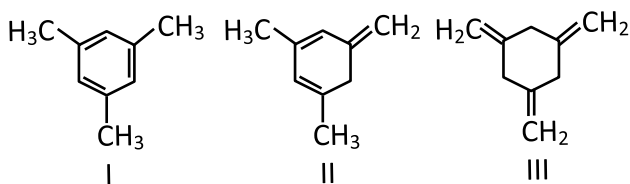
79. The boiling point of 0.2 mol kg^{-1} solution of X in water is greater than equimolar solution of Y in water. Which one of the following statements is **true** in this case ?

- (1) Molecular mass of X is greater than the molecular mass of Y.
(2) Molecular mass of X is less than the molecular mass of Y.
(3) Y is undergoing dissociation in water while X undergoes no change.
(4) X is undergoing dissociation in water.

80. The function of "Sodium pump" is a biological process operating in each and every cell of all animals. Which of the following biologically important ions is also a constituent of this pump ?

- (1) Mg^{2+} (2) K^+ (3) Fe^{2+} (4) Ca^{2+}

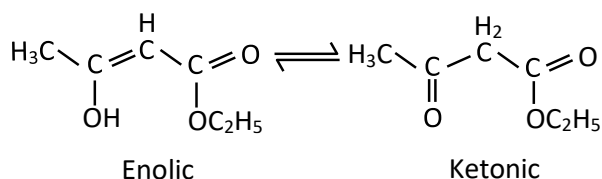
81. Given :-



The enthalpy of the hydrogenation of these compounds will be in the order as :-

- (1) III > II > I (2) II > III > I
(3) II > I > III (4) I > II > III

82. The enolic form of ethyl acetoacetate as below has :-



- (1) 16 sigma bonds and 1 pi - bond
(2) 9 sigma bonds and 2 pi - bonds
(3) 9 sigma bonds and 1 pi - bond
(4) 18 sigma bonds and 2 pi - bonds

83. Biodegradable polymer which can be produced from glycine and aminocaproic acid is :-

- (1) PHBV
(2) Buna - N
(3) Nylon 6, 6
(4) Nylon 2- nylon 6

84. Which of the following species contains equal number of σ - and π - bonds :-

- (1) XeO_4
(2) $(\text{CN})_2$
(3) $\text{CH}_2(\text{CN})_2$
(4) HCO_3^-

85. Which of these statements about $[\text{Co}(\text{CN})_6]^{3-}$ is true:-

- (1) $[\text{Co}(\text{CN})_6]^{3-}$ has four unpaired electrons and will be in a low-spin configuration.
(2) $[\text{Co}(\text{CN})_6]^{3-}$ has four unpaired electrons and will be in a high spin configuration.
(3) $[\text{Co}(\text{CN})_6]^{3-}$ has no unpaired electrons and will be in a high-spin configuration.
(4) $[\text{Co}(\text{CN})_6]^{3-}$ has no unpaired electrons and will be in a low-spin configuration.

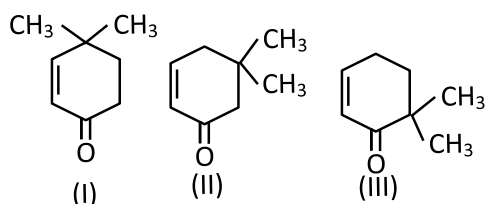
86. Which one is **not** equal to zero for an ideal solution :-

- (1) ΔS_{mix}
(2) ΔV_{mix}
(3) $\Delta P = P_{\text{observed}} - P_{\text{raoult}}$
(4) ΔH_{mix}

87. Which property of colloidal solution is independent of charge on the colloidal particles :-

- (1) Electrophoresis
(2) Electro-osmosis
(3) Tyndall effect
(4) Coagulation

88. Given :-



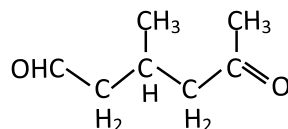
Which of the given compounds can exhibit tautomerism ?

- (1) I and III (2) II and III
(3) I, II and III (4) I and II

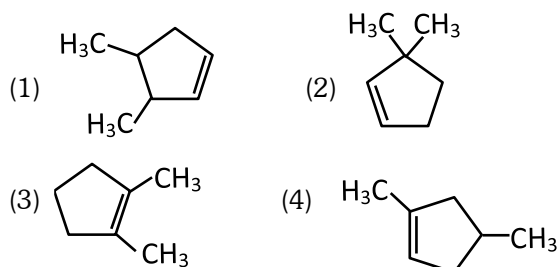
89. When initial concentration of a reactant is doubled in a reaction, its half-life period is not affected. The order of the reaction is :-

- (1) First
(2) Second
(3) More than zero but less than first
(4) Zero

90. A single compound of the structure :-



is obtainable from ozonolysis of which of the following cyclic compounds ?



91. Which of the following endoparasites of humans does show viviparity ?

- (1) *Enterobius vermicularis*
- (2) *Trichinella spiralis*
- (3) *Ascaris lumbricoides*
- (4) *Ancylostoma duodenale*

92. Cryopreservation of gametes of threatened species in viable and fertile condition can be referred to as:-

- (1) Advanced ex-situ conservation of biodiversity
- (2) In situ conservation by sacred groves
- (3) In situ cryo-conservation of biodiversity
- (4) In situ conservation of biodiversity

93. Which one of the following matches is **correct** ?

(1)	<i>Alternaria</i>	Sexual reproduction absent	Deuteromycetes
(2)	<i>Mucor</i>	Reproduction by conjugation	Ascomycetes
(3)	<i>Agaricus</i>	Parasitic fungus	Basidiomycetes
(4)	<i>Phytophthora</i>	Aseptate mycelium	Basidiomycetes

94. Minerals known to be required in large amounts for plant growth include :-

- (1) calcium, magnesium, manganese, copper
- (2) potassium, phosphorus, selenium, boron
- (3) magnesium, sulphur, iron, zinc
- (4) phosphorus, potassium, sulphur, calcium

95. Which of the following enhances or induces fusion of protoplasts ?

- (1) Polyethylene glycol and sodium nitrate
- (2) IAA and kinetin
- (3) IAA and gibberellins
- (4) Sodium chloride and potassium chloride

96. Which of these is **not** an important component of initiation of parturition in humans ?

- (1) Synthesis of prostaglandins
- (2) Release of oxytocin
- (3) Release of prolactin
- (4) Increase in estrogen and progesterone ratio

97. In which of the following gametophyte is **not** independent free living ?

- (1) *Marchantia*
- (2) *Pteris*
- (3) *Pinus*
- (4) *Funaria*

98. Which of the following is **not** a sexually transmitted disease ?

- (1) Acquired Immuno Deficiency Syndrome (AIDS)
- (2) Trichomoniasis
- (3) Encephalitis
- (4) Syphilis

99. Leaves become modified into spines in :-

- (1) Pea
- (2) Onion
- (3) Silk Cotton
- (4) *Opuntia*

100. Which one gives the most valid and recent explanation for stomatal movements ?

- (1) Potassium influx and efflux
- (2) Starch hydrolysis
- (3) Guard cell photosynthesis
- (4) Transpiration

101. Which of the following had the smallest brain capacity ?

- (1) *Homo sapiens*
- (2) *Homo neanderthalensis*
- (3) *Homo habilis*
- (4) *Homo erectus*

102. High value of BOD (Biochemical Oxygen Demand) indicates that :-

- (1) Water is highly polluted
- (2) Water is less polluted
- (3) Consumption of organic matter in the water is higher by the microbes
- (4) Water is pure

103. Sliding filament theory can be best explained as:-

- (1) Actin and Myosin filaments shorten and slide pass each other
- (2) Actin and Myosin filaments do not shorten but rather slide pass each other
- (3) When myofilaments slide pass each other, Myosin filaments shorten while Actin filaments do not shorten
- (4) When myofilaments slide pass each other Actin filaments shorten while Myosin filament do not shorten

104. A gymnast is able to balance his body upside down even in the total darkness because of :-

- (1) Vestibular apparatus (2) Tectorial membrane
- (3) Organ of corti (4) Cochlea

105. A man with blood group 'A' marries a woman with blood group 'B'. What are all the possible blood groups of their offsprings ?

- (1) A,B and AB only (2) A,B,AB and O
- (3) O only (4) A and B only

106. Typical growth curve in plants is :-

- (1) Linear (2) Stair-steps shaped
- (3) Parabolic (4) Sigmoid

107. The UN Conference of Parties on climate change in the year 2011 was held in :-

- (1) South Africa (2) Peru
- (3) Qatar (4) Poland

108. A technique of micropropagation is :-

- (1) Somatic embryogenesis
- (2) Protoplast fusion
- (3) Embryo rescue
- (4) Somatic hybridization

109. How many pairs of contrasting characters in pea plants were studied by Mendel in his experiments?

- (1) Six (2) Eight
- (3) Seven (4) Five

110. $\oplus \overline{\sigma} K_{(5)} \overline{C}_{(5)} A_5 \underline{G}_{(2)}$ is the floral formula of :-

- (1) *Sesbania* (2) *Petunia*
- (3) *Brassica* (4) *Allium*

111. The crops engineered for glyphosate are resistant/tolerant to :-

- (1) Bacteria (2) Insects
- (3) Herbicides (4) Fungi

112. Which of the following statements is **not correct**?

- (1) Goblet cells are present in the mucosa of intestine and secrete mucus
- (2) Oxyntic cells are present in the mucosa of stomach and secrete HCl.
- (3) Acini are present in the pancreas and secrete carboxypeptidase
- (4) Brunner's glands are present in the submucosa of stomach and secrete pepsinogen

113. In sea urchin DNA, which is double stranded, 17% of the bases were shown to be cytosine. The percentages of the other three bases expected to be present in this DNA are :-

- (1) G 17%, A 16.5%, T 32.5%
- (2) G 17%, A 33%, T 33%
- (3) G 8.5%, A 50%, T 24.5%
- (4) G 34%, A 24.5%, T 24.5%

114. In Bt cotton, the Bt toxin present in plant tissue as pro-toxin is converted into active toxin due to:-

- (1) Acidic pH of the insect gut
- (2) Action of gut micro-organisms
- (3) Presence of conversion factors in insect gut
- (4) Alkaline pH of the insect gut

115. Cytochromes are found in :-

- (1) Outer wall of mitochondria
- (2) Cristae of mitochondria
- (3) Lysosomes
- (4) Matrix of mitochondria

- 116.** Read the following five statements (A to E) and select the option with **all correct** statements :-
 (A) Mosses and Lichens are the first organisms to colonise a bare rock.
 (B) *Selaginella* is a homosporous pteridophyte
 (C) Coralloid roots in *Cycas* have VAM
 (D) Main plant body in bryophytes is gametophytic, whereas in pteridophytes it is sporophytic
 (E) In gymnosperms, male and female gametophytes are present within sporangia located on sporophyte
 (1) (B), (C) and (D) (2) (A), (D) and (E)
 (3) (B), (C) and (E) (4) (A), (C) and (D)
- 117.** Which one of the following is **correct** ?
 (1) Serum = Blood + Fibrinogen
 (2) Lymph = Plasma + RBC + WBC
 (3) Blood = Plasma + RBC + WBC
 (4) Plasma = Blood – Lymphocytes
- 118.** The movement of a gene from one linkage group to another is called :-
 (1) Duplication (2) Translocation
 (3) Crossing over (4) Inversion
- 119.** Which body of the Government of India regulates GM research and safety of introducing GM organisms for public services ?
 (1) Indian Council of Agricultural Research
 (2) Genetic Engineering Approval Committee
 (3) Research Committee on Genetic Manipulation
 (4) Bio-safety committee
- 120.** Rachel Carson's famous book "Silent Spring" is related to :-
 (1) Noise pollution
 (2) Population explosion
 (3) Ecosystem management
 (4) Pesticide pollution
- 121.** Gastric juice of infants contains :-
 (1) nuclease, pepsinogen, lipase
 (2) pepsinogen, lipase, rennin
 (3) amylase, rennin, pepsinogen
 (4) maltase, pepsinogen, rennin
- 122.** Which of the following is **not** one of the prime health risks associated with greater UV radiation through the atmosphere due to depletion of stratospheric ozone ?
 (1) Reduced Immune System
 (2) Damage to eyes
 (3) Increased liver cancer
 (4) Increased skin cancer
- 123.** Capacitation refers to changes in the :-
 (1) Ovum before fertilization
 (2) Ovum after fertilization
 (3) Sperm after fertilization
 (4) Sperm before fertilization
- 124.** Most animals are tree dwellers in a:-
 (1) Thorn woodland
 (2) Temperate deciduous forest
 (3) Tropical rain forest
 (4) Coniferous forest
- 125.** True nucleus is absent in :-
 (1) *Mucor* (2) *Vaucheria*
 (3) *Volvox* (4) *Anabaena*
- 126.** Glenoid cavity articulates :-
 (1) Scapula with acromion
 (2) Clavicle with scapula
 (3) Humerus with scapula
 (4) Clavicle with acromion
- 127.** Transmission tissue is characteristic feature of :-
 (1) Solid style (2) Dry stigma
 (3) Wet stigma (4) Hollow style
- 128.** DNA is **not** present in :-
 (1) Ribosomes (2) Nucleus
 (3) Mitochondria (4) Chloroplast
- 129.** Gene regulation governing lactose operon of *E.coli* that involves the lac I gene product is :
 (1) Negative and inducible because repressor protein prevents transcription
 (2) Negative and repressible because repressor protein prevents transcription
 (3) Feedback inhibition because excess of β -galactosidase can switch off trascription
 (4) Positive and inducible because it can be induced by lactose

130. Which of the following does **not** favour the formation of large quantities of dilute urine ?

- (1) Caffeine (2) Renin
(3) Atrial-natriuretic factor (4) Alcohol

131. What causes a green plant exposed to the light on only one side, to bend toward the source of light as it grows ?

- (1) Green plants seek light because they are phototropic
(2) Light stimulates plant cells on the lighted side to grow faster
(3) Auxin accumulates on the shaded side, stimulating greater cell elongation there.
(4) Green plants need light to perform photosynthesis

132. Nuclear envelope is a derivative of :-

- (1) Membrane of Golgi complex
(2) Microtubules
(3) Rough endoplasmic reticulum
(4) Smooth endoplasmic reticulum

133. Select the **correct** option :-

I		II	
(a)	Synapsis aligns homologous chromosomes	(i)	Anaphase-II
(b)	Synthesis of RNA and protein	(ii)	Zygotene
(c)	Action of enzyme recombinase	(iii)	G ₂ -phase
(d)	Centromeres do not separate but chromatids move towards opposite poles	(iv)	Anaphase-I
		(v)	Pachytene

- (a) (b) (c) (d)
(1) (ii) (iii) (v) (iv)
(2) (i) (ii) (v) (iv)
(3) (ii) (iii) (iv) (v)
(4) (ii) (i) (iii) (iv)

134. Keel is the characteristic feature of flower of :-

- (1) *Indigofera* (2) *Aloe*
(3) Tomato (4) Tulip

135. Perigynous flowers are found in :-

- (1) Cucumber (2) China rose
(3) Rose (4) Guava

136. A chemical signal that has both endocrine and neural roles is ?

- (1) Calcitonin (2) Epinephrine
(3) Cortisol (4) Melatonin

137. In which of the following both pairs have **correct** combination :-

- (1) *In situ* conservation: Cryopreservation
Ex situ conservation: Wildlife Sanctuary
(2) *In situ* conservation: Seed Bank
Ex situ conservation: National Park
(3) *In situ* conservation: Tissue culture
Ex situ conservation: Sacred groves
(4) *In situ* conservation : National Park
Ex situ conservation: Botanical Garden

138. HIV that causes AIDS, first starts destroying:

- (1) Leucocytes
(2) Helper T- Lymphocytes
(3) Thrombocytes
(4) B- Lymphocytes

139. Hysteresctomy is surgical removal of :

- (1) Prostate gland
(2) Vas-deference
(3) Mammary glands
(4) Uterus

140. Removal of proximal convoluted tubule from the nephron will result in:

- (1) More concentrated urine
(2) No change in quality and quantity of urine
(3) No urine formation
(4) More diluted urine

141. A major characteristic of the monocot root is the presence of :

- (1) Scattered vascular bundles
(2) Vasculature without cambium
(3) Cambium sandwiched between phloem and xylem along the radius
(4) Open vascular bundles

- 142.** Which of the following characteristics is mainly responsible for diversification of insects on land ?
 (1) Bilateral symmetry
 (2) Exoskeleton
 (3) Eyes
 (4) Segmentation
- 143.** Which of the following cells during gametogenesis is normally diploid?
 (1) Spermatid
 (2) Spermatogonia
 (3) Secondary polar body
 (4) Primary polar body
- 144.** The structures that are formed by stacking of organized flattened membranous sacs in the chloroplasts are :
 (1) Grana
 (2) Stroma lamellae
 (3) Stroma
 (4) Cristae
- 145.** The chromosomes in which centromere is situated close to one end are:
 (1) Acrocentric
 (2) Telocentric
 (3) Sub-metacentric
 (4) Metacentric
- 146.** In a ring girdled plant:
 (1) The root dies first
 (2) The shoot and root die together
 (3) Neither root nor shoot will die
 (4) The shoot dies first
- 147.** Vertical distribution of different species occupying different levels in a biotic community is known as:
 (1) Stratification (2) Zonation
 (3) Pyramid (4) Divergence
- 148.** Multiple alleles are present :
 (1) At different loci on the same chromosome
 (2) At the same locus of the chromosome
 (3) On non-sister chromatids
 (4) On different chromosomes
- 149.** The mass of living material at a trophic level at a particular time is called :
 (1) Standing state
 (2) Net primary productivity
 (3) Standing crop
 (4) Gross primary productivity
- 150.** Which of the following animals is **not** viviparous?
 (1) Elephant (2) Platypus
 (3) Whale (4) Flying fox (Bat)
- 151.** In an ecosystem the rate of production of organic matter during photosynthesis is termed as:
 (1) Gross primary productivity
 (2) Secondary productivity
 (3) Net productivity
 (4) Net primary productivity
- 152.** Erythropoiesis starts in :
 (1) Liver
 (2) Spleen
 (3) Red bone marrow
 (4) Kidney
- 153.** Which is the most common mechanism of genetic variation in the population of sexually reproducing organism?
 (1) Chromosomal aberrations
 (2) Genetic drift
 (3) Recombination
 (4) Transduction
- 154.** Blood pressure in the mammalian aorta is maximum during :
 (1) Diastole of the right ventricle
 (2) Systole of the left ventricle
 (3) Diastole of the right atrium
 (4) Systole of the left atrium
- 155.** When you hold your breath, which of the following gas changes in blood would first lead to the urge to breathe?
 (1) rising CO₂ concentration
 (2) falling CO₂ concentration
 (3) rising CO₂ and falling O₂ concentration
 (4) falling O₂ concentration
- 156.** Vascular bundles in monocotyledons are considered closed because:
 (1) Cambium is absent
 (2) There are no vessels with perforations
 (3) Xylem is surrounded all around by phloem
 (4) A bundle sheath surrounds each bundle

- 157.** Male gametes are flagellated in :
 (1) *Anabaena* (2) *Ectocarpus*
 (3) *Spirogyra* (4) *Polysiphonia*
- 158.** Which one of the following may require pollinators, but is genetically similar to autogamy?
 (1) Xenogamy (2) Apogamy
 (3) Cleistogamy (4) Geitonogamy
- 159.** In ginger vegetative propagation occurs through:
 (1) Offsets
 (2) Bulbils
 (3) Runners
 (4) Rhizome
- 160.** Which one of the following is **not** an inclusion body found in prokaryotes ?
 (1) Cyanophycin granule
 (2) Glycogen granule
 (3) Polysome
 (4) Phosphate granule
- 161.** A somatic cell that has just completed the S phase of its cell cycle, as compared to gamete of the same species, has :
 (1) same number of chromosomes but twice the amount of DNA
 (2) twice the number of chromosomes and four times the amount of DNA
 (3) four times the number of chromosomes and twice the amount of DNA
 (4) twice the number of chromosomes and twice the amount of DNA
- 162.** Alleles are :
 (1) true breeding homozygotes
 (2) different molecular forms of a gene
 (3) heterozygotes
 (4) different phenotype
- 163.** Select the **correct** matching in the following pairs:
 (1) Smooth ER – Synthesis of lipids
 (2) Rough ER– Synthesis of glycogen
 (3) Rough ER – Oxidation of fatty acids
 (4) Smooth ER – Oxidation of phospholipids

- 164.** The terga, sterna and pleura of cockroach body are joined by :
 (1) Muscular tissue
 (2) Arthroal membrane
 (3) Cartilage
 (4) Cementing glue

- 165.** Which of the following represents the correct combination without any exception ?

Characteristics		Class
(1)	Mouth ventral, gills without operculum; skin with placoid scales; persistent notochord	Chondrichthyes
(2)	Sucking and circular mouth; jaws absent, integument without scales; paired appendages	Cyclostomata
(3)	Body covered with feathers; skin moist and glandular; forelimbs form wings; lungs with air sacs	Aves
(4)	Mammary gland; hair on body; pinnae; two pairs of Limbs	Mammalia

- 166.** Which one of the following statements is **incorrect**?

- (1) In competitive inhibition, the inhibitor molecule is not chemically changed by the enzyme.
- (2) The competitive inhibitor does not affect the rate of breakdown of the enzyme-substrate complex.
- (3) The presence of the competitive inhibitor decreases the K_m of the enzyme for the substrate.
- (4) A competitive inhibitor reacts reversibly with the enzyme to form an enzyme-inhibitor complex.

- 167.** Which of the following regions of the brain is incorrectly paired with its function?

- (1) Cerebellum- language comprehension
- (2) Corpus callosum-communication between the left and right cerebral cortices
- (3) Cerebrum- calculation and contemplation
- (4) Medulla oblongata - homeostatic control

- 168.** Which one of the following statements is not true?

- (1) Pollen grains of some plants cause severe allergies and bronchial afflictions in some people
- (2) The flowers pollinated by flies and bats secrete foul odour to attract them
- (3) Honey is made by bees by digesting - pollen collected from flowers
- (4) Pollen grains are rich in nutrients, and they are used in the form of tablets and syrups

169. The active form of *Entamoeba histolytica* feeds upon:

- (1) mucosa and submucosa of colon only
- (2) food in intestine
- (3) blood only
- (4) erythrocytes; mucosa and submucosa of colon

170. Which of the following viruses is not transferred through semen of an infected male?

- (1) Human immunodeficiency virus
- (2) Chikungunya virus
- (3) Ebola virus
- (4) Hepatitis B virus

171. A population will not exist in Hardy - Weinberg equilibrium if :

- (1) There are no mutations
- (2) There is no migration
- (3) The population is large
- (4) Individuals mate selectively

172. The guts of cow and buffalo possess:

- (1) *Chlorella* spp.
- (2) Methanogens
- (3) Cyanobacteria
- (4) *Fucus* spp.

173. The hilum is a scar on the :

- (1) Fruit, where it was attached to pedicel
- (2) Fruit, where style was present
- (3) Seed, where micropyle was present
- (4) Seed, where funicle was attached

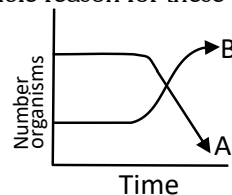
174. Secondary Succession takes place on/in :

- (1) Degraded forest
- (2) Newly created pond
- (3) Newly cooled lava
- (4) Bare rock

175. Which one of the following statements is **wrong**?

- (1) Agar - agar is obtained from *Gelidium* and *Gracilaria*
- (2) *Chlorella* and *Spirulina* are used as space food
- (3) Mannitol is stored food in Rhodophyceae
- (4) Algin and carrageen are products of algae

176. The following graph depicts changes in two populations (A and B) of herbivores in a grassy field. A possible reason for these changes is that :



- (1) Population B competed more successfully for food than population A
- (2) Population A produced more offspring than population B
- (3) Population A consumed the members of population B
- (4) Both plant populations in this habitat decreased

177. Match each disease with its **correct** type of vaccine:

- | | |
|--------------------|------------------------|
| (a) tuberculosis | (i) harmless virus |
| (b) whooping cough | (ii) inactivated toxin |
| (c) diphtheria | (iii) killed bacteria |
| (d) polio | (iv) harmless bacteria |
-
- | (a) | (b) | (c) | (d) |
|-----------|-------|-------|-------|
| (1) (iii) | (ii) | (iv) | (i) |
| (2) (iv) | (iii) | (ii) | (i) |
| (3) (i) | (ii) | (iv) | (iii) |
| (4) (ii) | (i) | (iii) | (iv) |

178. Which of the following are the important floral rewards to the animal pollinators?

- (1) Nectar and pollen grains
- (2) Floral fragrance and calcium crystals
- (3) Protein pellicle and stigmatic exudates
- (4) Colour and large size flower

179. An abnormal human baby with 'XXX' sex chromosomes was born due to :

- (1) formation of abnormal ova in the mother
- (2) fusion of two ova and one sperm
- (3) fusion of two sperms and one ovum
- (4) formation of abnormal sperms in the father

180. Transpiration and root pressure cause water to rise in plants by :

- (1) Pulling and pushing it, respectively
- (2) Pushing it upward
- (3) Pushing and pulling it, respectively
- (4) Pushing it upward

ANSWER KEY

AIPMT-2015

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	3	1	2	1	1	4	4	1	1	4	1	2	1	3	2
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	1	2	2	1	1	2	2	2	1	1	3	2	2	1	4
Que.	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Ans.	2	2	4	2	2	2	3	1	4	3	2	3	2	3	4
Que.	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ans.	4	2	3	3	2	3	2	2	3	2	1	4	4	4	1
Que.	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Ans.	2	3	3	1	4	2	2	1	2	4	2	4	4	1	2
Que.	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
Ans.	2	2	4	4	2	1	4	4	1	4	1	3	3	1	4
Que.	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105
Ans.	2	1	1	4	1	3	3	3	4	1	3	1	2	1	2
Que.	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
Ans.	4	1	1	3	2	3	4	2	4	2	2	3	2	2	4
Que.	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135
Ans.	2	3	4	3	4	3	1	1	1	2	3	3	1	1	3
Que.	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
Ans.	2	4	2	4	4	2	2	2	1	1	1	1	2	3	2
Que.	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165
Ans.	1	3	3	2	1	1	2	4	4	3	2	2	1	2	1
Que.	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
Ans.	3	1	3	4	2	4	2	4	1	3	1	2	1	1	1

HINT - SHEET

1. Magnetic field due to a circular loop

$$B = \frac{\mu_0 N I}{2r}$$

Where $N \rightarrow$ no. of loops

$$I = \frac{q}{T} = \frac{e}{1/n} = ne$$

$$B = \frac{\mu_0 n e}{2r} \quad (\text{Here } N = 1 \text{ as } e^- \text{ makes only one loop})$$

2. $\Delta U = n C_V \Delta T$ & $T = \frac{PV}{nR}$

$$\text{so } \Delta T = T_2 - T_1 = \frac{P_2 V_2 - P_1 V_1}{nR}$$

$$\text{so } \Delta U = \frac{nR}{\gamma - 1} \left(\frac{P_2 V_2 - P_1 V_1}{nR} \right) = \frac{P_2 V_2 - P_1 V_1}{\gamma - 1}$$

$$\Rightarrow \Delta U = \frac{-8 \times 10^3}{2/5} = -20 \text{ kJ}$$

3. $y_1 = a \sin \omega t$ & $y_2 = b \cos \omega t = b \sin \left(\omega t + \frac{\pi}{2} \right)$

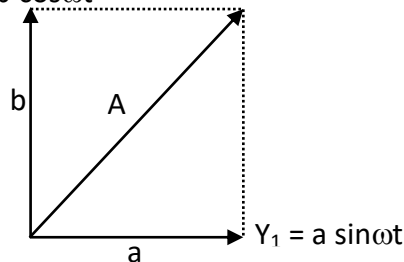
since the frequencies for both SHM are same, resultant motion will be SHM. Now

$$\text{Amplitude } A = \sqrt{A_1^2 + A_2^2 + 2A_1 A_2 \cos \phi}$$

$$\text{here } A_1 = a, A_2 = b \text{ \& } \phi = \frac{\pi}{2}$$

$$\text{so } A = \sqrt{a^2 + b^2}$$

$$Y_2 = b \cos \omega t$$



OR

$$A = \sqrt{a^2 + b^2}$$

4. $v = \beta x^{-2n}$

so $\frac{dv}{dx} = -2n\beta x^{-2n-1}$

Now $a = v \frac{dv}{dx} = (\beta x^{-2n}) (-2n\beta x^{-2n-1})$

$\Rightarrow a = -2n\beta^2 x^{-4n-1}$

5. $R \propto A^{1/3}$

$\frac{R_{Al}}{R_{Te}} = \left(\frac{27}{125}\right)^{1/3} \Rightarrow R_{Te} = \frac{5}{3} R_{Al}$

6. Angular fringe width of interference in double slit

experiment $= \frac{\beta}{D} = \frac{\frac{\lambda D}{d}}{D} = \frac{\lambda}{d}$

Angular width of central maxima in diffraction

experiment $= \frac{2\lambda}{d'}$

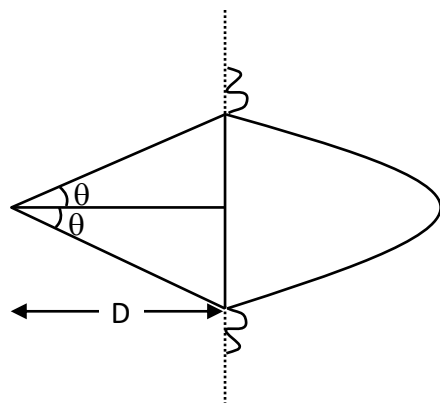
According to the question

$\frac{10\lambda}{d} = \frac{2\lambda}{d'}$

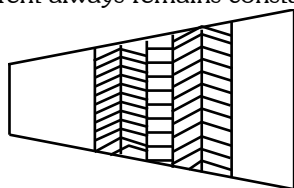
$\Rightarrow d' = 0.2 d = 0.2 \text{ mm}$

7. Linear width of central maxima $= D (2\theta) =$

$2D\theta = 2D \frac{\lambda}{a}$



8. Metallic conductor can be considered as the combination of various conductors connected in series combination. And in series combination the current always remains constant.



9. From Wein's displacement law

$\lambda_m \propto \frac{1}{T}$

Now from sequence 'VIBGYOR'

$(\lambda_m)_P < (\lambda_m)_R < (\lambda_m)_Q$

So $T_P > T_R > T_Q$

10. Potential gradient $= \frac{1mV}{cm} = 10^{-3}V/cm = 10^{-1}V/m$

Let the resistance to be connected is R then

$I = \frac{2}{8+R}$

Potential drop across the potentiometer wire

$= \frac{8 \times 2}{8+R} = \frac{16}{8+R}$

Potential gradient $= \left(\frac{16}{8+R}\right) \times \frac{1}{4} V/m$

$= \frac{4}{8+R} = 0.1$

$\Rightarrow R = 32\Omega$

11. For H-like atoms

$v = \frac{Z}{n} \times 2.188 \times 10^6 \text{ m/s}$

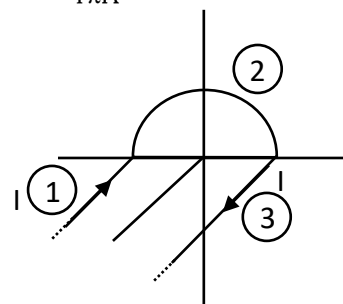
here $Z = 2, n = 3$

$v = 1.46 \times 10^6 \text{ m/s}$

12. 'B' due to segment '1'

$B_1 = \frac{\mu_0 I}{4\pi R} [\sin 90^\circ + \sin \theta] (-\hat{k})$

$B_1 = \frac{\mu_0 I}{4\pi R} (-\hat{k}) = B_3$



B due to segment '2'

$B_2 = \frac{\mu_0 I}{4R} (-\hat{i})$

so 'B' at center $\vec{B}_c = \vec{B}_1 + \vec{B}_2 + \vec{B}_3$

$\Rightarrow \vec{B}_c = \frac{-\mu_0 I}{4R} \left(\hat{i} + \frac{2\hat{k}}{\pi} \right) = \frac{-\mu_0 I}{4\pi R} = (\pi\hat{i} + 2\hat{k})$

13. $P = \frac{hc}{\lambda} \Rightarrow P \propto \frac{1}{\lambda}$ (Rectangular hyperbola)

14. Once the capacitor is charged, its charge will be constant $Q = CV$

When dielectric slab is inserted

$$C'_{\text{New}} = KC$$

$$E = \frac{Q^2}{2C} \Rightarrow E_{\text{New}} = \frac{1}{K} E_{\text{initial}}$$

$$V = \frac{Q}{C} \text{ so } V_{\text{new}} = \frac{1}{K} V$$

15. Fundamental frequency of closed organ pipe

$$= \frac{v}{4\ell_c}$$

2nd overtone frequency of open organ pipe

$$= \frac{3v}{2\ell_0}$$

$$\text{Now } \frac{v}{4\ell_c} = \frac{3v}{2\ell_0} \Rightarrow \ell_0 = 6\ell_c = 6(20 \text{ cm}) = 120 \text{ cm}$$

16. $\mu = \frac{\sin\left(\frac{\delta_m + A}{2}\right)}{\sin\left(\frac{A}{2}\right)}$

$$\therefore \mu = \cot(A/2)$$

$$\therefore \cot(A/2) = \frac{\sin\left(\frac{\delta_m + A}{2}\right)}{\sin\left(\frac{A}{2}\right)}$$

$$\Rightarrow \cos(A/2) = \sin\left(\frac{\delta_m + A}{2}\right)$$

$$\Rightarrow 90^\circ - A/2 = \frac{\delta_m + A}{2}$$

$$\Rightarrow \delta_m = 180^\circ - 2A$$

17. $y_1 = \bar{A}, y_2 = \bar{B}$,

$$y = \overline{y_1 + y_2} = \overline{\bar{A} + \bar{B}} \quad (\text{using De-morgan's theorem})$$

$$y = A \cdot B$$

Hence this logic gate represents AND gate.

18. For Engine & refrigerators operating between two same temperatures

$$\eta = \frac{1}{1+\beta} \Rightarrow \frac{1}{10} = \frac{1}{1+\beta} \Rightarrow \beta = 9$$

$$\beta = \frac{Q_2}{W} \quad (\text{From the principle of refrigerator})$$

$$9 = \frac{Q_2}{10} \Rightarrow Q_2 = 90 \text{ Joule}$$

19. $eV_s = E - \phi \Rightarrow V_s = \frac{hc}{\lambda_e} - \frac{hc}{\lambda_0 e}$

here

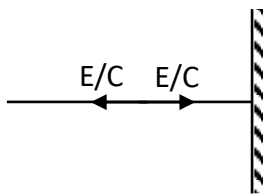
$$3V_0 = \frac{hc}{\lambda_e} - \frac{hc}{\lambda_0 e} \quad \dots(1)$$

$$\text{and } V_0 = \frac{hc}{2\lambda_e} - \frac{hc}{\lambda_0 e} \quad \dots(2)$$

equation (1) - 3 × equation (2)

$$\Rightarrow 0 = -\frac{hc}{2\lambda_e} + \frac{2hc}{\lambda_0 e} \Rightarrow \lambda_0 = 4\lambda$$

20.



$$\text{Momentum of light } p = \frac{E}{C}$$

So momentum transferred to the surface

$$= p_f - p_i = \frac{2E}{C}$$

21. Angular momentum remains Constant because of the torque of tension is zero.

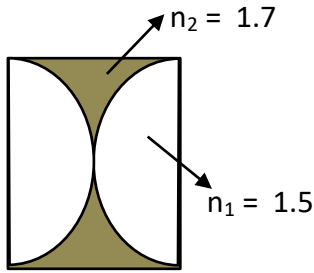
$$\Rightarrow L_i = L_f$$

$$\Rightarrow mv_0 R = mv \frac{R}{2}$$

$$\Rightarrow v = 2v_0$$

$$KE_f = \frac{1}{2} m (2v_0)^2 = 2mv_0^2$$

22.



From lens maker's formula

$$\frac{1}{f} = (\mu - 1) \left(\frac{1}{R_1} - \frac{1}{R_2} \right)$$

we have $\frac{1}{f_1} = (1.5 - 1) \left(\frac{1}{20} \right) = \frac{1}{40}$

$$\frac{1}{f_2} = (1.5 - 1) \left(\frac{1}{20} \right) = \frac{1}{40}$$

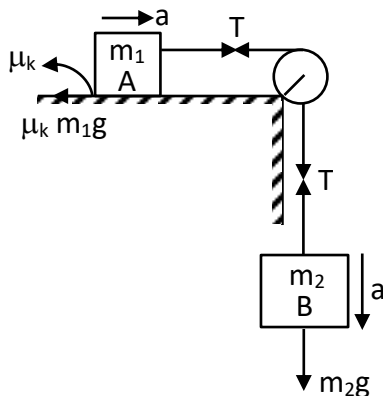
& $\frac{1}{f_3} = (1.7 - 1) \left(\frac{2}{-20} \right) = -\frac{7}{100}$

Now $\frac{1}{f} = \frac{1}{f_1} + \frac{1}{f_2} + \frac{1}{f_3}$

$$\Rightarrow \frac{1}{f} = \frac{1}{40} + \frac{1}{40} - \frac{7}{100}$$

$$\Rightarrow f = -50 \text{ cm}$$

23.



For the motion of both blocks

$$m_2 g - T = m_2 a$$

$$T - \mu_k m_1 g = m_1 a \Rightarrow$$

$$a = \frac{(m_2 - \mu_k m_1)g}{m_1 + m_2}$$

For the block of mass 'm₂'

$$m_2 g - T = m_2 \left[\frac{m_2 - \mu_k m_1}{m_1 + m_2} \right] g$$

$$T = m_2 g - \left[\frac{m_2 - \mu_k m_1}{m_1 + m_2} \right] m_2 g = m_2 g \left[\frac{m_1 + \mu_k m_1}{m_1 + m_2} \right]$$

$$\Rightarrow T = \frac{m_1 m_2 (1 + \mu_k) g}{m_1 + m_2}$$

24. For particle undergoing SHM

$$V = \omega \sqrt{A^2 - x^2}$$

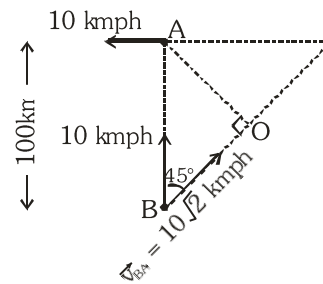
$$\text{so } V_1 = \omega \sqrt{A^2 - x_1^2} \quad \& \quad V_2 = \omega \sqrt{A^2 - x_2^2}$$

solving these two equations we get

$$\omega = \frac{\sqrt{V_1^2 - V_2^2}}{\sqrt{x_2^2 - x_1^2}} = \frac{2\pi}{T}$$

$$\Rightarrow T = 2\pi \sqrt{\frac{x_2^2 - x_1^2}{V_1^2 - V_2^2}}$$

25.



$$|\vec{v}_{BA}| = \sqrt{10^2 + 10^2} = 10\sqrt{2} \text{ kmph}$$

$$\text{distance } OB = 100 \cos 45^\circ = 50\sqrt{2} \text{ km}$$

Time taken to reach the shortest distance between

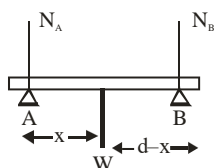
$$A \& B = \frac{50\sqrt{2}}{|\vec{v}_{BA}|} = \frac{50\sqrt{2}}{10\sqrt{2}}$$

$$t_{sn} = 5 \text{ hrs.}$$

26. By torque balancing about B

$$N_A(d) = W(d-x)$$

$$\Rightarrow N_A = \frac{W(d-x)}{d}$$



27. As we know
- $B = \frac{P}{\frac{\Delta V}{V}}$

$$\text{so } \frac{\Delta V}{V} = \frac{P}{B}$$

$$\text{Now } P = \rho gh \text{ \& compressibility 'K' = } \frac{1}{B}$$

$$\begin{aligned} \text{So } \frac{\Delta V}{V} &= \rho gh (K) \\ &= 10^3 \times 9.8 \times 2700 \times 45.4 \times 10^{-11} \\ &= 1.201 \times 10^{-2} \end{aligned}$$

28. Energy will always be conserved so

$$K.E._{\text{initial}} = K.E._{\text{final}} + \text{Excitation energy}$$

$$\frac{1}{2} m_1 u_1^2 + \frac{1}{2} m_2 u_2^2 = \frac{1}{2} m_1 v_1^2 + \frac{1}{2} m_2 v_2^2 + \varepsilon$$

- 29.
- $T = \frac{2\pi r}{v} = \frac{2\pi r}{\sqrt{GM}}$

$$\left(\text{as } v = \sqrt{\frac{GM}{r}} \right)$$

$$T = \frac{2\pi}{\sqrt{GM}} r^{3/2}$$

$$T^2 = \frac{4\pi^2}{GM} \cdot r^3$$

Comparing

$$K = \frac{4\pi^2}{GM}$$

- 30.
- $W = - \int F dx$

$$W = - \int_{20}^{30} 0.1x dx$$

$$W = -0.1 \left[\frac{x^2}{2} \right]_{20}^{30}$$

$$W = -0.1 \left[\frac{900 - 400}{2} \right] = -25$$

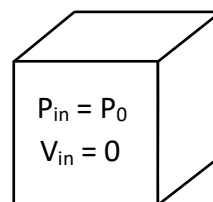
From work energy theorem $W = K_f - K_i$

$$\Rightarrow -25 = K_f - \frac{1}{2} 10(10)^2$$

$$\Rightarrow K_f = 475$$

31. By Bernaulli's equation
- $P + \frac{1}{2} \rho v^2 = P_0 + 0$

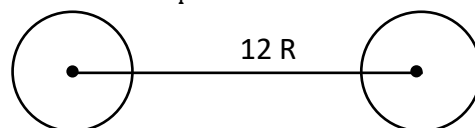
$$P_0 - P = \frac{1}{2} \rho v^2$$



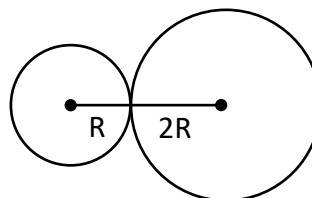
$$F = \frac{1}{2} \rho v^2 A$$

$$F = 2.4 \times 10^5 \text{ upward}$$

- 32.



Initial distance between their centers = 12R



At time of collision the distance between their centers = 3R

So total distance travelled by both = 12R - 3R

$$= 9R$$

Since the bodies move under mutual forces, center of mass will remain stationary so

$$m_1 x_1 = m_2 x_2$$

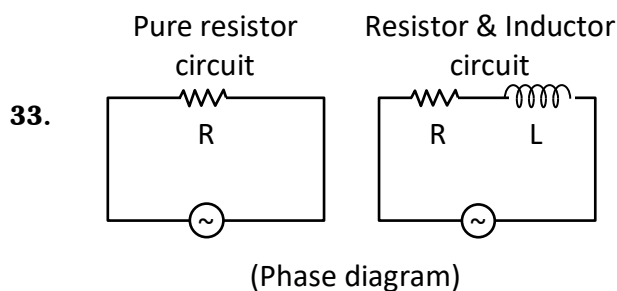
$$mx = 5m(9R - x)$$

$$x = 45R - 5x$$

$$6x = 45R$$

$$x = \frac{45}{6} R$$

$$\boxed{x = 7.5R}$$



AC source

Impedance = Z

$$P' = V.I.\cos\phi$$

$$P = \frac{V^2}{R}$$

$$P' = V \cdot \left[\frac{V}{Z} \right] \cdot \cos\phi$$

$$\Rightarrow V^2 = PR$$

$$P' = \frac{V^2}{Z} \cdot \frac{R}{Z}$$

(From phasor diagram)

$$P' = \frac{(PR)R}{Z^2}$$

$$P' = \left(\frac{R}{Z} \right)^2 P$$

34. $\gamma = 1 + \frac{2}{n}$

Here degree of freedom $\rightarrow n$

$$\therefore \gamma = 1 + \frac{2}{n}$$

35. In cyclic process ABCA,

$$\Delta U_{\text{cyclic}} = 0$$

$$Q_{\text{cyclic}} = W_{\text{cyclic}}$$

$$Q_{AB} + Q_{BC} + Q_{CA} = \text{closed loop area.}$$

$$400 + 100 + Q_{CA} = \frac{1}{2} (2 \times 10^{-3}) \times 4 \times 10^4$$

$$400 + 100 - Q_{AC} = 40$$

$$Q_{AC} = 460 \text{ J}$$

36. Applying dimensional analysis

$$S \propto E^a V^b T^c$$

$$M^1 L^0 T^{-2} = k [M^1 L^2 T^{-2}]^a [L^1 T^{-1}]^b [T^1]^c$$

$$M^1 L^0 T^{-2} = k [M^a L^{2a} T^{-2a}] L^b T^{-b+c}$$

Comparison

$$a = 1 \begin{cases} 2a + b = 0 \\ b = -2 \end{cases} \begin{cases} -2 = -2a - b + c \\ -2 = -2(1) + 2 + c \end{cases}$$

$$c = -2$$

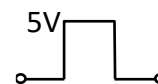
So the dimensional formula for surface tension will be $[E^1 V^{-2} T^{-2}]$

Alternate solution :

$$\text{Surface Tension} = \frac{\text{Surface energy}}{\text{Area}}$$

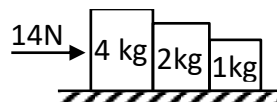
$$[\text{Surface tension}] = \frac{[E]}{[V \cdot T]^2} = [E V^{-2} T^{-2}]$$

37. This is the circuit where P-N junction is acting as a Half-wave rectifier so the output will be



38. Acceleration of system = $\frac{F_{\text{net}}}{M_{\text{total}}}$

$$= \frac{14}{4 + 2 + 1} = 2 \text{ m/s}^2$$



The contact force between 4 kg & 2 kg block will move 2 kg & 1 kg block with the same acceleration

$$\text{so } F_{\text{contact}} = (2 + 1)a = 3(2) = 6\text{N}$$

39. Effective resistance of B & C

$$= \frac{(1.5R)(3R)}{1.5R + 3R} = R$$

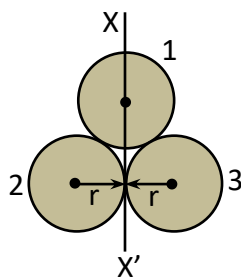
In series sequence $V \propto R$

so voltage across 'A' = voltage across B & C

Now B & C are parallel so $V_B = V_C$

$$\Rightarrow V_A = V_B = V_C$$

40.



$$I_{xx'} = I_1 + I_2 + I_3$$

$$\frac{2}{3}mr^2 + \left(\frac{2}{3}mr^2 + mr^2\right) + \left(\frac{2}{3}mr^2 + mr^2\right)$$

(Using parallel axis theorem)

$$\Rightarrow I_{xx'} = 2mr^2 + 2mr^2 = 4mr^2$$

41. Flux linked with sphere = $\vec{E} \cdot d\vec{s}$

since electric field is radial. It is always perpendicular to the surface.

$$\text{so } \phi = Ar(4\pi r^2)$$

$$\phi = A(a)(4\pi r^2) \quad (\text{as } r = a)$$

$$\phi = A4\pi a^3$$

Now according to gauss law

$$\phi = \frac{q_{\text{in}}}{\epsilon_0} \Rightarrow q_{\text{in}} = \phi \cdot \epsilon_0$$

$$\text{so } q_{\text{in}} = A4\pi a^3 \epsilon_0$$

42. Rate of heat flow \propto temperature difference between two ends

$$\Rightarrow \frac{dQ}{dt} \propto (T_2 - T_1)$$

Here temperature difference in both case is same (i.e. 10°C)

So, rate of heat flow will also be same

$$\text{So, } \frac{dQ}{dt} = 4 \text{ J/s}$$

43. Given $K_P > K_Q$

$$\text{Case (a) : } x_1 = x_2 = x$$

$$\frac{W_P}{W_Q} = \frac{\frac{1}{2}K_P x^2}{\frac{1}{2}K_Q x^2} = \frac{K_P}{K_Q} \Rightarrow W_P > W_Q$$

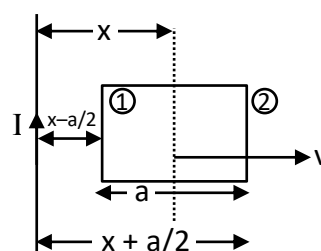
$$\text{Case (b) : } F_1 = F_2 = F$$

For constant force

$$W = \frac{F^2}{2K} \Rightarrow W \propto \frac{1}{K}$$

$$\text{So } \frac{W_P}{W_Q} = \frac{K_Q}{K_P} \Rightarrow W_Q > W_P$$

44.



emf Induced in side (1)

$$\epsilon_1 = B_1 V \ell$$

emf Induced in side (2)

$$\epsilon_2 = B_2 V \ell$$

$$\text{emf in the frame} = B_1 V \ell - B_2 V \ell$$

$$\epsilon = V \ell [B_1 - B_2]$$

$$\Rightarrow \epsilon \propto B_1 - B_2 \quad \text{Since } B \propto \frac{1}{r}$$

$$\text{So } \epsilon \propto \left[\frac{1}{x - \frac{a}{2}} - \frac{1}{x + \frac{a}{2}} \right]$$

$$\Rightarrow \epsilon \propto \left[\frac{1}{(2x - a)} - \frac{1}{(2x + a)} \right]$$

45. $P = Fv = mav \Rightarrow K = mv \frac{dv}{dt}$

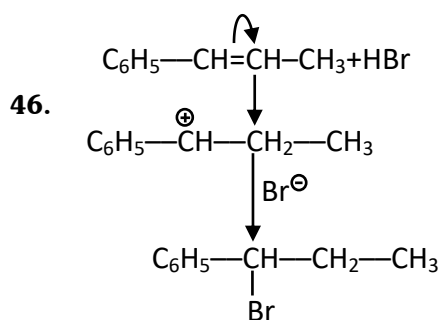
By integrating the equation

$$\Rightarrow \int v dv = \int \frac{k}{m} dt \Rightarrow \frac{v^2}{2} = \frac{k}{m} t$$

$$\Rightarrow v = \sqrt{\frac{2k}{m} t}$$

$$a = \frac{dv}{dt} = \sqrt{\frac{2k}{m}} \left(\frac{1}{2} t^{-1/2} \right)$$

$$F = ma = m \left(\frac{1}{2} \right) \sqrt{\frac{2k}{m} t} \Rightarrow F = \sqrt{\frac{mk}{2t}}$$



47. Volume of nitrogen collected at 300 K and 725 mm pressure is 40 mL actual pressure
= 725 - 25 = 700 mm

Volume of nitrogen at STP

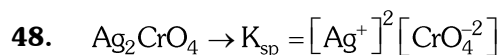
$$= \frac{273 \times 700 \times 40}{300 \times 760} = 33.52 \text{ mL}$$

22,400 mL of N_2 at STP weight = 28 g

$$33.5 \text{ mL of nitrogen weight} = \frac{28 \times 33.52}{22400} \text{ g}$$

Percentage of nitrogen

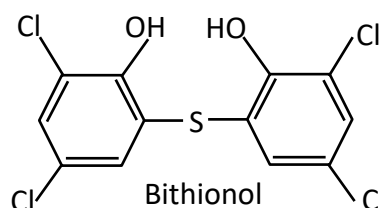
$$= \frac{28 \times 33.52 \times 100}{22400 \times 0.25} = 16.76\%$$



$$\Rightarrow [\text{Ag}^+] = \sqrt{\frac{K_{sp}}{[\text{CrO}_4^{2-}]}} = \sqrt{\frac{1.1 \times 10^{-12}}{[\text{CrO}_4^{2-}]}} = \text{max}^m$$

so answer is Ag_2CrO_4

49. Bithionol (the compound is also called bithional) is added to soaps to impart antiseptic properties



50. Metal nitrates are stable like NaNO_3 and KNO_3 and highly soluble in water.

51. According to molecular orbital theory (MOT)

	O_2^-	O_2^+	O_2^{+2}
No. of e^-	17	15	14
Bond order	1.5	2.5	3.0

52. In isoelectronic species

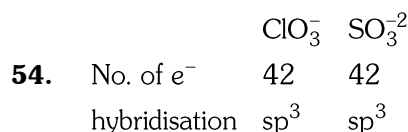
$$\text{Atomic radius} \propto \frac{1}{Z_{\text{eff}}}$$

hence increasing order of radius is $\text{Ca}^{+2} < \text{K}^+ < \text{Ar}$

53. Arrhenius equation

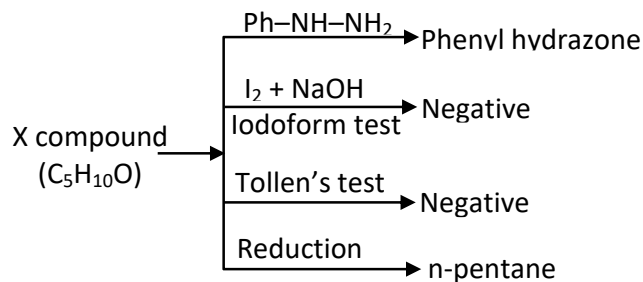
$$K = A.e^{-E_a/RT} \Rightarrow \ln K = \ln A - \frac{E_a}{RT}$$

so, activation energy of reaction can be determined from the slope of $\ln K$ vs $\frac{1}{T}$

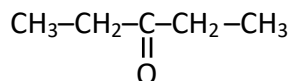


both are having one lone pair on central atom hence they are pyramidal.

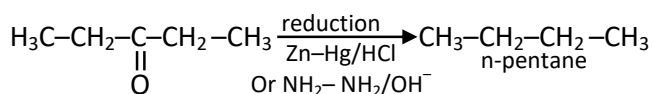
55.



According to questions



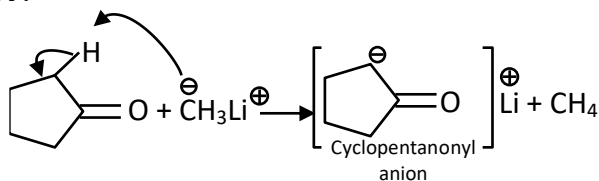
does not give iodoform as well as Tollen's test



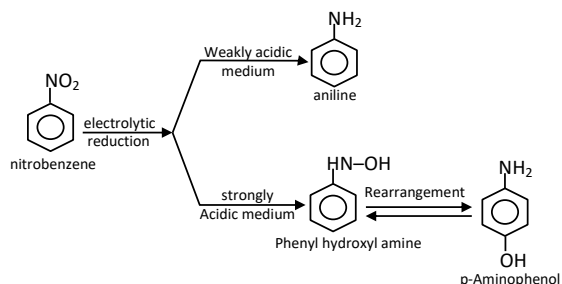
56. According to molecular orbital theory (MOT)

	O_2^-	O_2	O_2^+
No. of e^-	17	16	15
Bond order	1.5	2	2.5

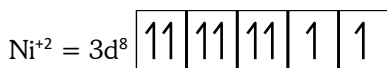
57.



58.



59.

number of unpaired electrons (n) = 2

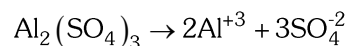
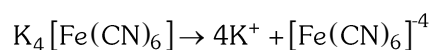
$$\therefore \mu = \sqrt{n(n+2)}$$

hence $\mu = 2.84$ B.M., paramagnetic

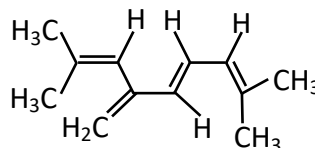
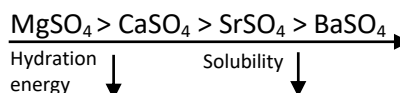
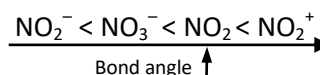
$$60. \text{ FCC : } r = \frac{a}{2\sqrt{2}} = \frac{361}{2 \times 1.4141} = 127 \text{ pm}$$

61. After leaving Cl^- , due to resonance, π bond electron is also transferred

62. van't Hoff factor of

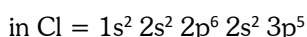
so $n = 5$ so $n = 5 \Rightarrow i = n = 5$ 63. NO_2 is not used as food preservative.

64.

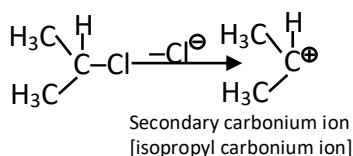
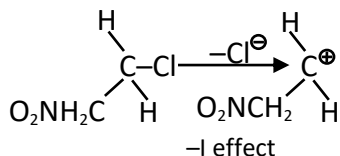
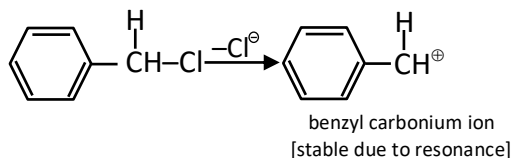
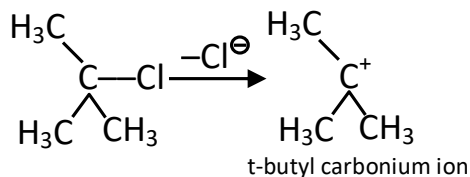
Total π bonds = 4Total π electrons = 865. Due to very small size of Mg^{+2} , Mg^{+2} shows maximum hydration energy.66. NO_2^+ : sp hybridisation (bond angle = 180°)

67. The value of equilibrium constant for reaction

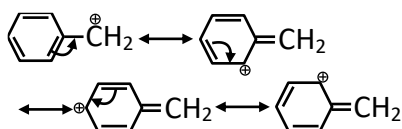
$$K = 1.6 \times 10^{12}$$

The value of K is very high so the system will contain mostly products at equilibrium.68. $Fe^{+2} = 3d^6$ (number of 'd' electrons = 6)total p electrons = 11, which are not equal to number of 'd' electrons in Fe^{+2}

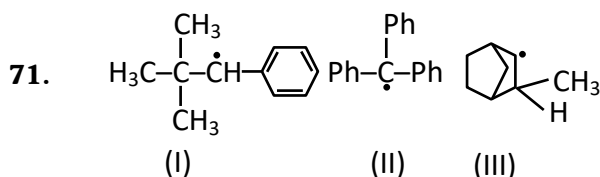
69.



Most stable carbonium ion is benzyl carbocation due to resonance

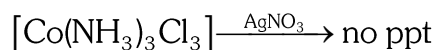
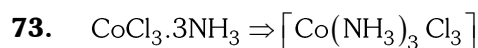


70. A device that converts energy of combustion of fuels, directly into electrical energy is known as fuel cell.



Only (III) has H in conjugation with free radical

72. Given reaction is an important laboratory method for the preparation of symmetrical and unsymmetrical ethers. In this method, an alkyl halide is allowed to react with sodium alkoxide.



74. $\frac{w_{\text{H}_2}}{w_{\text{O}_2}} = \frac{1}{4} \Rightarrow \frac{n_{\text{H}_2}}{n_{\text{O}_2}} = \frac{1/2}{4/32} = \frac{4}{1}$



No change in the oxidation state of iron

76. Due to lanthanoid contraction
atomic radii of Zr and Hf is almost similar.

77. $\Delta G^0 = -2.30RT \log K$

because at equilibrium $\Delta G = 0$

78. Orbital angular momentum = $\sqrt{\ell(\ell+1)} \cdot \hbar$

for d-orbital $\ell = 2$

so orbital angular momentum = $\sqrt{2(2+1)} \hbar = \sqrt{6} \hbar$

79. $(\Delta T_b)_x > (\Delta T_b)_y$

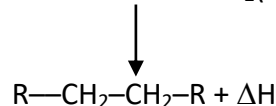
same solvent so, K_b is same

m is same (given)

$$i_x \cdot k_b \cdot m > i_y \cdot k_b \cdot m \Rightarrow i_x > i_y$$

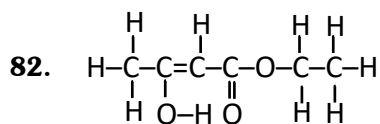
so, x is undergoing dissociation in water.

80. K^+ ion is a constituent of sodium pump



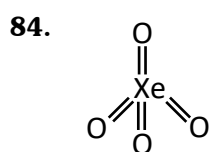
enthalpy of hydrogenation

$$\propto \frac{1}{\text{stability of alkene}}$$



$$18 \sigma + 2\pi$$

83. Nylon 2-nylon-6 is an alternating polyamide copolymer of glycine ($\text{NH}_2\text{-CH}_2\text{-COOH}$) and amino caproic acid [$\text{NH}_2\text{-(CH}_2\text{)}_5\text{COOH}$] and is biodegradable.



number of σ bonds = 4

number of π bonds = 4



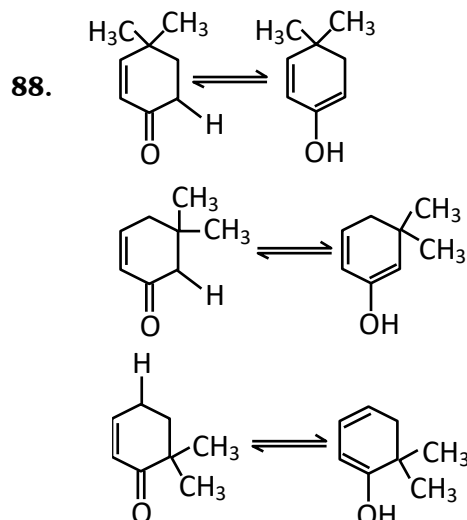
\therefore in presence of strong field ligand, pairing of

electrons occurs so in this complex no unpaired

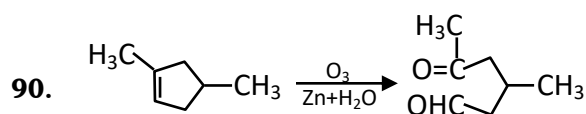
electron is present and it is low spin complex.

86. For an ideal solution $\Delta S_{\text{mix}} > 0$

87. Tyndall effect is an optical property, so it is independent of charge.



89. $t_{1/2} = \frac{0.693}{K}$ for first order $t_{1/2}$ is independent of concentration



AIPMT - 2014

1. If force (F), velocity (V) and time (T) are taken as fundamental units, then the dimension of mass are:-

(1) $[F V T^{-1}]$ (2) $[F V T^{-2}]$
(3) $[F V^{-1} T^{-1}]$ (4) $[F V^{-1} T]$

2. A projectile is fired from the surface of the earth with a velocity of 5 ms^{-1} and angle θ with the horizontal. Another projectile fired from another planet with a velocity of 3 ms^{-1} at the same angle follows a trajectory which is identical with the trajectory of the projectile fired from the earth. The value of the acceleration due to gravity on the planet is (in ms^{-2}) is: (given $g = 9.8 \text{ m/s}^2$)

(1) 3.5 (2) 5.9 (3) 16.3 (4) 110.8

3. A particle is moving such that its position coordinate (x, y) are

(2m, 3m) at time $t = 0$

(6m, 7m) at time $t = 2 \text{ s}$ and

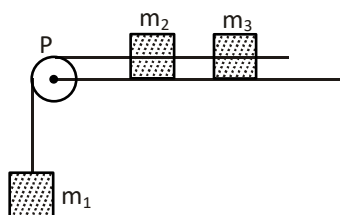
(13m, 14m) at time $t = 5 \text{ s}$.

Average velocity vector (\vec{V}_{av}) from $t = 0$ to $t = 5 \text{ s}$ is :-

(1) $\frac{1}{5}(13\hat{i} + 14\hat{j})$ (2) $\frac{7}{3}(\hat{i} + \hat{j})$

(3) $2(\hat{i} + \hat{j})$ (4) $\frac{11}{5}(\hat{i} + \hat{j})$

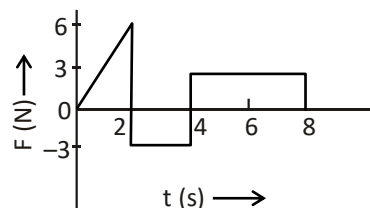
4. A system consists of three masses m_1 , m_2 and m_3 connected by a string passing over a pulley P. The mass m_1 hangs freely and m_2 and m_3 are on a rough horizontal table (the coefficient of friction = μ). The pulley is frictionless and of negligible mass. The downward acceleration of mass m_1 is :
(Assume $m_1 = m_2 = m_3 = m$)



(1) $\frac{g(1-2\mu)}{9}$ (2) $\frac{2g\mu}{3}$
(3) $\frac{g(1-2\mu)}{3}$ (4) $\frac{g(1-2\mu)}{2}$

5. The force 'F' acting on a particle of mass 'm' is indicated by the force-time graph shown below.

The change in momentum of the particle over the time interval from zero to 8 s is :-



(1) 24 Ns (2) 20 Ns
(3) 12 Ns (4) 6 Ns

6. A balloon with mass 'm' is descending down with an acceleration 'a' (where $a < g$). How much mass should be removed from it so that it starts moving up with an acceleration 'a' ?

(1) $\frac{2ma}{g+a}$ (2) $\frac{2ma}{g-a}$

(3) $\frac{ma}{g+a}$ (4) $\frac{ma}{g-a}$

7. A body of mass (4m) is lying in x-y plane at rest. It suddenly explodes into three pieces. Two pieces, each of mass (m) move perpendicular to each other with equal speeds (v). The total kinetic energy generated due to explosion is :-

(1) mv^2
(2) $\frac{3}{2}mv^2$
(3) $2mv^2$
(4) $4mv^2$

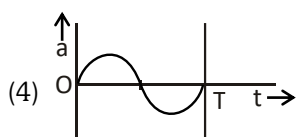
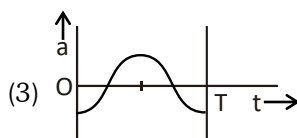
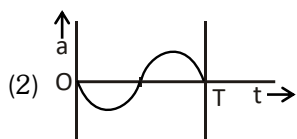
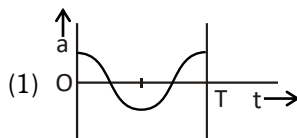
8. The oscillation of a body on a smooth horizontal surface is represented by the equation,

$$X = A \cos(\omega t)$$

where X = displacement at time t

ω = frequency of oscillation

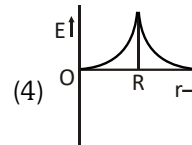
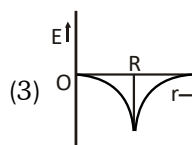
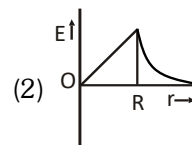
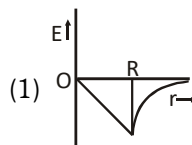
Which one of the following graphs shows correctly the variation 'a' with 't'?



Here a = acceleration at time t
 T = Time period

9. A solid cylinder of mass 50 kg and radius 0.5 m is free to rotate about the horizontal axis. A massless string is wound round the cylinder with one end attached to it and other hanging freely. Tension in the string required to produce an angular acceleration of 2 revolutions s^{-2} is :-
(1) 25 N (2) 50 N (3) 78.5 N (4) 157 N
10. The ratio of the accelerations for a solid sphere (mass ' m ' and radius ' R ') rolling down an incline of angle ' θ ' without slipping and slipping down the incline without rolling is :-
(1) 5 : 7
(2) 2 : 3
(3) 2 : 5
(4) 7 : 5
11. A black hole is an object whose gravitational field is so strong that even light cannot escape from it. To what approximate radius would earth (mass = 5.98×10^{24} kg) have to be compressed to be a black hole ?
(1) 10^{-9} m (2) 10^{-6} m
(3) 10^{-2} m (4) 100 m

12. Dependence of intensity of gravitational field (E) of earth with distance (r) from centre of earth is correctly represented by:-



13. Copper of fixed volume ' V ' is drawn into wire of length ' ℓ '. When this wire is subjected to a constant force ' F ', the extension produced in the wire is ' $\Delta \ell$ '. Which of the following graphs is a straight line ?

(1) $\Delta \ell$ versus $\frac{1}{\ell}$

(2) $\Delta \ell$ versus ℓ^2

(3) $\Delta \ell$ versus $\frac{1}{\ell^2}$

(4) $\Delta \ell$ versus ℓ

14. A certain number of spherical drops of a liquid of radius ' r ' coalesce to form a single drop of radius ' R ' and volume ' V '. If ' T ' is the surface tension of the liquid, then :

(1) energy = $4VT \left(\frac{1}{r} - \frac{1}{R} \right)$ is released

(2) energy = $3VT \left(\frac{1}{r} + \frac{1}{R} \right)$ is absorbed

(3) energy = $3VT \left(\frac{1}{r} - \frac{1}{R} \right)$ is released

(4) Energy is neither released nor absorbed

15. Steam at 100°C is passed into 20 g of water at 10°C . When water acquires a temperature of 80°C , the mass of water present will be :

[Take specific heat of water = $1 \text{ cal g}^{-1} ^\circ\text{C}^{-1}$ and latent heat of steam = 540 cal g^{-1}]

- (1) 24 g (2) 31.5 g (3) 42.5 g (4) 22.5 g

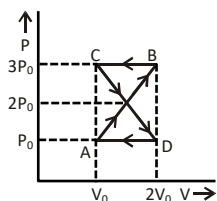
16. Certain quantity of water cools from 70°C to 60°C in the first 5 minutes and to 54°C in the next 5 minutes. The temperature of the surroundings is:-

- (1) 45°C (2) 20°C (3) 42°C (4) 10°C

17. A monoatomic gas at a pressure P , having a volume V expands isothermally to a volume $2V$ and then adiabatically to a volume $16V$. The final pressure of the gas is: (take $\gamma = \frac{5}{3}$)

- (1) $64P$ (2) $32P$ (3) $\frac{P}{64}$ (4) $16P$

18. A thermodynamic system undergoes cyclic process ABCDA as shown in fig. The work done by the system in the cycle is :-



- (1) P_0V_0 (2) $2P_0V_0$ (3) $\frac{P_0V_0}{2}$ (4) Zero

19. The mean free path of molecules of a gas, (radius 'r') is inversely proportional to :-

- (1) r^3 (2) r^2 (3) r (4) \sqrt{r}

20. If n_1 , n_2 and n_3 are the fundamental frequencies of three segments into which a string is divided, then the original fundamental frequency n of the string is given by :-

(1) $\frac{1}{n} = \frac{1}{n_1} + \frac{1}{n_2} + \frac{1}{n_3}$

(2) $\frac{1}{\sqrt{n}} = \frac{1}{\sqrt{n_1}} + \frac{1}{\sqrt{n_2}} + \frac{1}{\sqrt{n_3}}$

(3) $\sqrt{n} = \sqrt{n_1} + \sqrt{n_2} + \sqrt{n_3}$

(4) $n = n_1 + n_2 + n_3$

21. The number of possible natural oscillations of air column in a pipe closed at one end of length 85 cm whose frequencies lie below 1250 Hz are: (velocity of sound = 340 ms^{-1})

- (1) 4 (2) 5

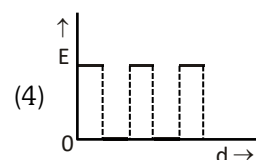
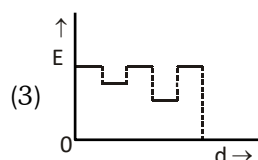
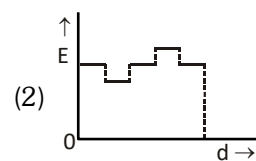
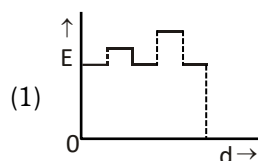
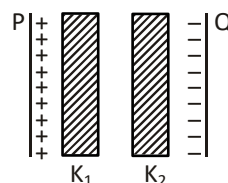
- (3) 7 (4) 6

22. A speeding motorcyclist sees traffic jam ahead of him. He slows down to 36 km/hour . He finds that traffic has eased and a car moving ahead of him at 18 km/hour is honking at a frequency of 1392 Hz . If the speed of sound is 343 m/s , the frequency of the honk as heard by him will be :-

- (1) 1332 Hz (2) 1372 Hz

- (3) 1412 Hz (4) 1454 Hz

23. Two thin dielectric slabs of dielectric constants K_1 and K_2 ($K_1 < K_2$) are inserted between plates of a parallel plate capacitor, as shown in the figure. The variation of electric field 'E' between the plates with distance 'd' as measured from plate P is correctly shown by :-



24. A conducting sphere of radius R is given a charge Q . The electric potential and the electric field at the centre of the sphere respectively are:-

- (1) Zero and $\frac{Q}{4\pi\epsilon_0 R^2}$
 (2) $\frac{Q}{4\pi\epsilon_0 R}$ and Zero
 (3) $\frac{Q}{4\pi\epsilon_0 R}$ and $\frac{Q}{4\pi\epsilon_0 R^2}$
 (4) Both are zero

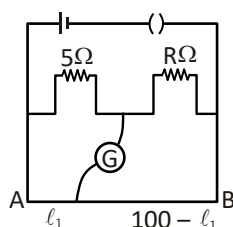
25. In a region, the potential is represented by $V(x, y, z) = 6x - 8xy - 8y + 6yz$, where V is in volts and x, y, z are in metres. The electric force experienced by a charge of 2 coulomb situated at point $(1, 1, 1)$ is :-

- (1) $6\sqrt{5}$ N (2) 30 N (3) 24 N (4) $4\sqrt{35}$ N

26. Two cities are 150 km apart. Electric power is sent from one city to another city through copper wires. The fall of potential per km is 8 volt and the average resistance per km is 0.5Ω . the power loss in the wires is :-

- (1) 19.2 W (2) 19.2 kW
 (3) 19.2 J (4) 12.2 kW

27. The resistance in the two arms of the meter bridge are 5Ω and $R\Omega$, respectively. When the resistance R is shunted with an equal resistance, the new balance point is at $1.6 \ell_1$. The resistance 'R' is :-



- (1) 10Ω (2) 15Ω (3) 20Ω (4) 25Ω

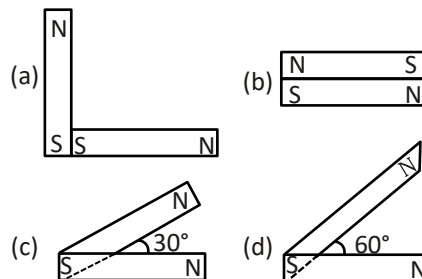
28. A potentiometer circuit has been set up for finding the internal resistance of a given cell. The main battery, used across the potentiometer wire, has an emf of 2.0 V and a negligible internal resistance. The potentiometer wire itself is 4m long, When the resistance R , connected across the given cell, has values of.

- (i) infinity (ii) 9.5Ω

The balancing lengths, on the potentiometer wire are found to be 3 m and 2.85 m, respectively. The value of internal resistance of the cell is

- (1) 0.25Ω (2) 0.95Ω
 (3) 0.5Ω (4) 0.75Ω

29. Following figures show the arrangement of bar magnets in different configurations. Each magnet has magnetic dipole moment \vec{m} . Which configuration has highest net magnetic dipole moment ?



- (1) (a) (2) (b) (3) (c) (4) (d)

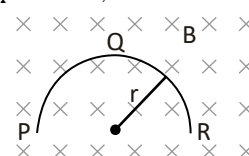
30. In an ammeter 0.2% of main current passes through the galvanometer. If resistance of galvanometer is G , the resistance of ammeter will be :-

- (1) $\frac{1}{499} G$ (2) $\frac{499}{500} G$ (3) $\frac{1}{500} G$ (4) $\frac{500}{499} G$

31. Two identical long conducting wires AOB and COD are placed at right angle to each other, with one above other such that 'O' is their common point for the two. The wires carry I_1 and I_2 currents respectively. Point 'P' is lying at distance 'd' from 'O' along a direction perpendicular to the plane containing the wires. The magnetic field at the point 'P' will be :-

- (1) $\frac{\mu_0}{2\pi d} \left(\frac{I_1}{I_2} \right)$ (2) $\frac{\mu_0}{2\pi d} (I_1 + I_2)$
 (3) $\frac{\mu_0}{2\pi d} (I_1^2 - I_2^2)$ (4) $\frac{\mu_0}{2\pi d} (I_1^2 + I_2^2)^{1/2}$

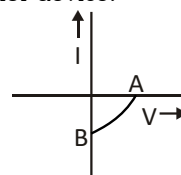
32. A thin semicircular conducting ring (PQR) of radius 'r' is falling with its plane vertical in a horizontal magnetic field B , as shown in figure. The potential difference developed across the ring when its speed is v , is :-



- (1) Zero
 (2) $Bv\pi r^2/2$ and P is at higher potential
 (3) $\pi r B v$ and R is at higher potential
 (4) $2r B v$ and R is at higher potential

33. A transformer having efficiency of 90% is working on 200V and 3kW power supply. If the current in the secondary coil is 6A, the voltage across the secondary coil and the current in the primary coil respectively are:-
 (1) 300 V, 15A (2) 450 V, 15A
 (3) 450V, 13.5A (4) 600V, 15A
34. Light with an energy flux of $25 \times 10^4 \text{ Wm}^{-2}$ falls on a perfectly reflecting surface at normal incidence. If the surface area is 15 cm^2 , the average force exerted on the surface is :-
 (1) $1.25 \times 10^{-6} \text{ N}$ (2) $2.50 \times 10^{-6} \text{ N}$
 (3) $1.20 \times 10^{-6} \text{ N}$ (4) $3.0 \times 10^{-6} \text{ N}$
35. A beam of light of $\lambda = 600 \text{ nm}$ from a distant source falls on a single slit 1 mm wide and the resulting diffraction pattern is observed on a screen 2 m away. The distance between first dark fringes on either side of the central bright fringe is :-
 (1) 1.2 cm (2) 1.2 mm (3) 2.4 cm (4) 2.4 mm
36. In the Young's double-slit experiment, the intensity of light at a point on the screen where the path difference is λ is K, (λ being the wave length of light used). The intensity at a point where the path difference is $\lambda/4$, will be :-
 (1) K (2) K/4 (3) K/2 (4) Zero
37. If the focal length of objective lens is increased then magnifying power of :-
 (1) microscope will increase but that of telescope decrease.
 (2) microscope and telescope both will increase.
 (3) microscope and telescope both will decrease
 (4) microscope will decrease but that of telescope increase.
38. The angle of a prism is 'A'. One of its refracting surfaces is silvered. Light rays falling at an angle of incidence 2A on the first surface returns back through the same path after suffering reflection at the silvered surface. The refractive index μ , of the prism is :-
 (1) $2\sin A$ (2) $2\cos A$
 (3) $\frac{1}{2} \cos A$ (4) $\tan A$
39. When the energy of the incident radiation is increased by 20%, the kinetic energy of the photoelectrons emitted from a metal surface increased from 0.5 eV to 0.8 eV. The work function of the metal is :-
 (1) 0.65 eV (2) 1.0 eV
 (3) 1.3 eV (4) 1.5 eV

40. If the kinetic energy of the particle is increased to 16 times its previous value, the percentage change in the de-Broglie wavelength of the particle is :-
 (1) 25 (2) 75 (3) 60 (4) 50
41. Hydrogene atom is ground state is excited by a monochromatic radiation of $\lambda = 975 \text{ \AA}$. Number of spectral lines in the resulting spectrum emitted will be
 (1) 3 (2) 2 (3) 6 (4) 10
42. The Binding energy per nucleon of ${}^7_3\text{Li}$ and ${}^4_2\text{He}$ nuclei are 5.60 MeV and 7.06 MeV, respectively. In the nuclear reaction ${}^7_3\text{Li} + {}^1_1\text{H} \rightarrow {}^4_2\text{He} + Q$, the value of energy Q released is :-
 (1) 19.6 MeV (2) -2.4 MeV
 (3) 8.4 MeV (4) 17.3 MeV
43. A radio isotope 'X' with a half life 1.4×10^9 years decays to 'Y' which is stable. A sample of the rock from a cave was found to contain 'X' and 'Y' in the ratio 1 : 7. The age of the rock is :
 (1) 1.96×10^9 years (2) 3.92×10^9 years
 (3) 4.20×10^9 years (4) 8.40×10^9 years
44. The given graph represents V - I characteristic for a semiconductor device.

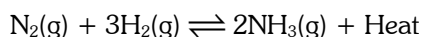


Which of the following statement is **correct**?

- (1) It is V - I characteristic for solar cell where, point A represents open circuit voltage and point B short circuit current.
 (2) It is for a solar cell and point A and B represent open circuit voltage and current, respectively.
 (3) It is for photodiode and points A and B represent open circuit voltage and current, respectively.
 (4) It is for a LED and points A and B represent open circuit voltage and short circuit current, respectively.
45. The barrier potential of a p-n junction depends on:
 (a) type of semi conductor material
 (b) amount of doping
 (c) temperature
- Which one of the following is correct ?
 (1) (a) and (b) only (2) (b) only
 (3) (b) and (c) only (4) (a), (b) and (c)

46. What is the maximum number of orbitals that can be identified with the following quantum numbers? $n = 3$, $\ell = 1$, $m = 0$
- (1) 1 (2) 2
(3) 3 (4) 4
47. Calculate the energy in joule corresponding to light of wavelength 45 nm :
(Planck's constant $h = 6.63 \times 10^{-34}$ Js; speed of light $c = 3 \times 10^8$ ms $^{-1}$)
- (1) 6.67×10^{15} (2) 6.67×10^{11}
(3) 4.42×10^{-15} (4) 4.42×10^{-18}
48. Equal masses of H_2 , O_2 and methane have been taken in a container of volume V at temperature 27°C in identical conditions. The ratio of the volumes of gases $H_2 : O_2 : \text{methane}$ would be :
- (1) 8 : 16 : 1 (2) 16 : 8 : 1
(3) 16 : 1 : 2 (4) 8 : 1 : 2
49. If a is the length of the side of a cube, the distance between the body centered atom and one corner atom in the cube will be :
- (1) $\frac{2}{\sqrt{3}}a$ (2) $\frac{4}{\sqrt{3}}a$
(3) $\frac{\sqrt{3}}{4}a$ (4) $\frac{\sqrt{3}}{2}a$
50. Which property of colloids is **not** dependent on the charge on colloidal particles ?
- (1) Coagulation (2) Electrophoresis
(3) Electro - osmosis (4) Tyndall effect
51. Which of the following salts will give highest pH in water ?
- (1) KCl (2) NaCl
(3) Na_2CO_3 (4) $CuSO_4$
52. Of the following 0.10M aqueous solutions, which one will exhibit the largest freezing point depression?
- (1) KCl (2) $C_6H_{12}O_6$
(3) $Al_2(SO_4)_3$ (4) K_2SO_4
53. When 22.4 litres of $H_2(g)$ is mixed with 11.2 litres of $Cl_2(g)$, each at S.T.P., the moles of HCl (g) formed is equal to :-
- (1) 1 mol of HCl (g)
(2) 2 mol of HCl (g)
(3) 0.5 mol of HCl (g)
(4) 1.5 mol of HCl (g)
54. When 0.1 mol MnO_4^{2-} is oxidised the quantity of electricity required to completely oxidise MnO_4^{2-} to MnO_4^- is :-
- (1) 96500 C
(2) 2×96500 C
(3) 9650 C
(4) 96.50 C
55. Using the Gibbs energy change, $\Delta G^\circ = + 63.3$ kJ, for the following reaction,
- $$Ag_2CO_3 \rightleftharpoons 2Ag^+(aq) + CO_3^{2-}(aq)$$
- the K_{sp} of $Ag_2CO_3(s)$ in water at 25°C is :-
($R = 8.314$ J K $^{-1}$ mol $^{-1}$)
- (1) 3.2×10^{-26} (2) 8.0×10^{-12}
(3) 2.9×10^{-3} (4) 7.9×10^{-2}
56. The weight of silver (at wt. = 108) displaced by a quantity of electricity which displaces 5600 mL of O_2 at STP will be :-
- (1) 5.4 g (2) 10.8 g
(3) 54.0 g (4) 108.0 g
57. Which of the following statements is correct for the spontaneous adsorption of a gas ?
- (1) ΔS is negative and therefore, ΔH should be highly positive
(2) ΔS is negative and therefore, ΔH should be highly negative
(3) ΔS is positive and therefore, ΔH should be negative
(4) ΔS is positive and therefore, ΔH should also be highly positive

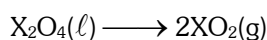
58. For the reversible reaction :



The equilibrium shifts in forward direction :

- (1) By increasing the concentration of $\text{NH}_3(\text{g})$
- (2) By decreasing the pressure
- (3) By decreasing the concentrations of $\text{N}_2(\text{g})$ and $\text{H}_2(\text{g})$
- (4) By increasing pressure and decreasing temperature

59. For the reaction :



$$\Delta U = 2.1 \text{ k cal}, \Delta S = 20 \text{ cal K}^{-1} \text{ at } 300 \text{ K}$$

Hence ΔG is :-

- (1) 2.7 k cal
- (2) - 2.7 k cal
- (3) 9.3 k cal
- (4) - 9.3 k cal

60. For a given exothermic reaction, K_p and K'_p are the equilibrium constants at temperatures T_1 and T_2 , respectively. Assuming that heat of reaction is constant in temperature range between T_1 and T_2 , it is readily observed that :-

- (1) $K_p > K'_p$
- (2) $K_p < K'_p$
- (3) $K_p = K'_p$
- (4) $K_p = \frac{1}{K'_p}$

61. Which of the following orders of ionic radii is correctly represented ?

- (1) $\text{H}^- > \text{H}^+ > \text{H}$
- (2) $\text{Na}^+ > \text{F}^- > \text{O}^{2-}$
- (3) $\text{F}^- > \text{O}^{2-} > \text{Na}^+$
- (4) $\text{Al}^{3+} > \text{Mg}^{2+} > \text{N}^{3-}$

62. 1.0 g of magnesium is burnt with 0.56 g O_2 in a closed vessel. Which reactant is left in excess and how much ?

(At. wt. Mg = 24 ; O = 16)

- (1) Mg, 0.16 g
- (2) O_2 , 0.16 g
- (3) Mg, 0.44 g
- (4) O_2 , 0.28 g

63. The pair of compounds that can exist together is:-

- (1) FeCl_3 , SnCl_2
- (2) HgCl_2 , SnCl_2
- (3) FeCl_2 , SnCl_2
- (4) FeCl_3 , KI

64. Be^{2+} is isoelectronic with which of the following ions?

- (1) H^+
- (2) Li^+
- (3) Na^+
- (4) Mg^{2+}

65. Which of the following molecules has the maximum dipole moment ?

- (1) CO_2
- (2) CH_4
- (3) NH_3
- (4) NF_3

66. Which one of the following species has planar triangular shape ?

- (1) N_3^-
- (2) NO_3^-
- (3) NO_2^-
- (4) CO_2

67. Acidity of diprotic acids in aqueous solutions increases in the order :-

- (1) $\text{H}_2\text{S} < \text{H}_2\text{Se} < \text{H}_2\text{Te}$
- (2) $\text{H}_2\text{Se} < \text{H}_2\text{S} < \text{H}_2\text{Te}$
- (3) $\text{H}_2\text{Te} < \text{H}_2\text{S} < \text{H}_2\text{Se}$
- (4) $\text{H}_2\text{Se} < \text{H}_2\text{Te} < \text{H}_2\text{S}$

68. (a) $\text{H}_2\text{O}_2 + \text{O}_3 \rightarrow \text{H}_2\text{O} + 2\text{O}_2$

(b) $\text{H}_2\text{O}_2 + \text{Ag}_2\text{O} \rightarrow 2\text{Ag} + \text{H}_2\text{O} + \text{O}_2$

Role of hydrogen peroxide in the above reactions is respectively -

- (1) Oxidizing in (a) and reducing in (b)
- (2) Reducing in (a) and oxidizing in (b)
- (3) Reducing in (a) and (b)
- (4) Oxidizing in (a) and (b)

69. Artificial sweetener which is stable under cold conditions only is :-

- (1) Saccharine
- (2) Sucralose
- (3) Aspartame
- (4) Alitame

70. In acidic medium, H_2O_2 changes $\text{Cr}_2\text{O}_7^{2-}$ to CrO_5 which has two ($-\text{O}-\text{O}-$) bonds. Oxidation state of Cr in CrO_5 is :-

- (1) + 5
- (2) + 3
- (3) + 6
- (4) - 10

71. The reaction of aqueous KMnO_4 with H_2O_2 in acidic conditions gives :-

- (1) Mn^{4+} and O_2
- (2) Mn^{2+} and O_2
- (3) Mn^{2+} and O_3
- (4) Mn^{4+} and MnO_2

72. Among the following complexes the one which shows Zero crystal field stabilization energy (CFSE) is :-

- (1) $[\text{Mn}(\text{H}_2\text{O})_6]^{3+}$
- (2) $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$
- (3) $[\text{Co}(\text{H}_2\text{O})_6]^{2+}$
- (4) $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$

73. Magnetic moment 2.83 BM is given by which of the following ions ?

(At. nos. Ti = 22, Cr = 24, Mn = 25, Ni = 28):-

- (1) Ti^{3+} (2) Ni^{2+}
(3) Cr^{3+} (4) Mn^{2+}

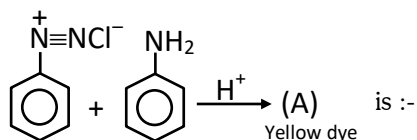
74. Which of the following complexes is used to be as an anticancer agent?

- (1) $\text{mer-}[\text{Co}(\text{NH}_3)_3\text{Cl}_3]$
(2) $\text{cis-}[\text{PtCl}_2(\text{NH}_3)_2]$
(3) $\text{cis-}[\text{PtCl}_2\text{Br}_2]$
(4) Na_2CoCl_4

75. Reason of lanthanoid contraction is :-

- (1) Negligible screening effect of 'f' orbitals
(2) Increasing nuclear charge
(3) Decreasing nuclear charge
(4) Decreasing screening effect

76. In the following reaction, the product (A) is :-

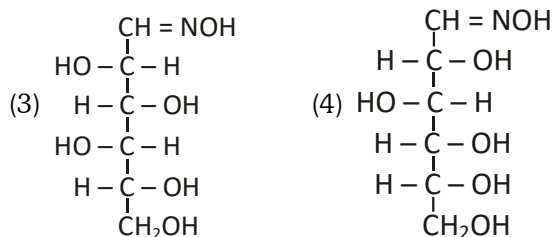
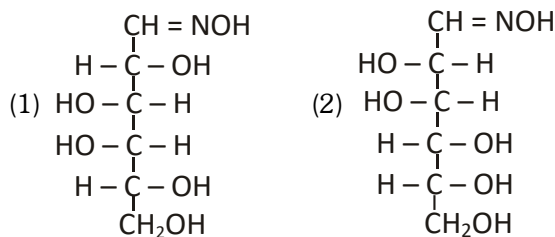


- (1)
- (2)
- (3)
- (4)

77. Which of the following will be most stable diazonium salt RN_2^+X^- ?

- (1) $\text{CH}_3\text{N}_2^+\text{X}^-$
(2) $\text{C}_6\text{H}_5\text{N}_2^+\text{X}^-$
(3) $\text{CH}_3\text{CH}_2\text{N}_2^+\text{X}^-$
(4) $\text{C}_6\text{H}_5\text{CH}_2\text{N}_2^+\text{X}^-$

78. D (+) glucose reacts with hydroxylamine and yields an oxime. The structure of the oxime would be :

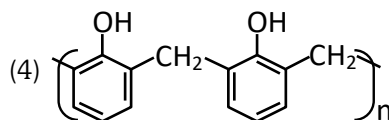
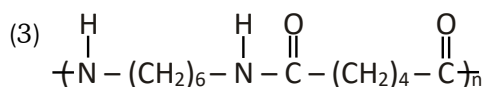


79. Which of the following hormones is produced under the condition of stress which stimulates glycogenolysis in the liver of human beings?

- (1) Thyroxin (2) Insulin
(3) Adrenaline (4) Estradiol

80. Which one of the following is an example of a thermosetting polymer?

- (1) $\text{-(CH}_2\text{-C(CH}_3\text{)=CH-CH}_2\text{)-}_n$
(2) $\text{-(CH}_2\text{-CH(CH}_3\text{)-CH}_2\text{)-}_n$



81. Which of the following organic compounds polymerizes to form the polyester Dacron?

- (1) Propylene and para $\text{HO-(C}_6\text{H}_4\text{)-OH}$
(2) Benzoic acid and ethanol
(3) Terephthalic acid and ethylene glycol
(4) Benzoic acid and para $\text{HO-(C}_6\text{H}_4\text{)-OH}$

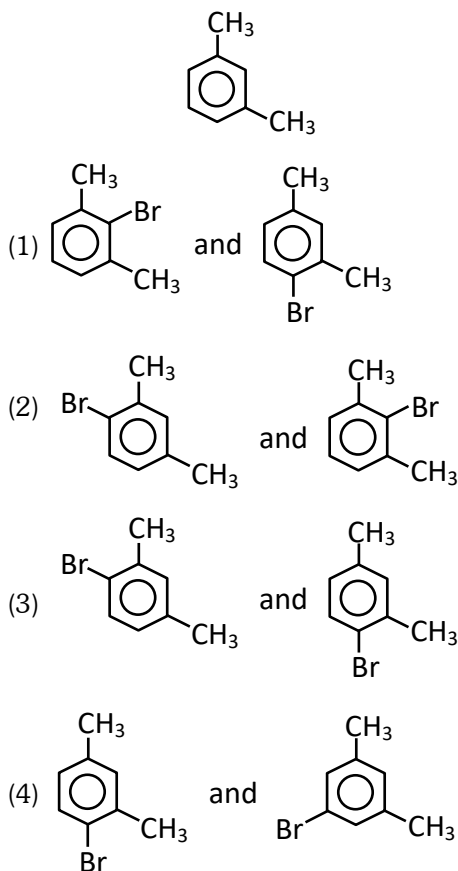
82. Which one of the following is **not** a common component of Photochemical Smog?

- (1) Ozone
- (2) Acrolein
- (3) Peroxyacetyl nitrate
- (4) Chlorofluorocarbons

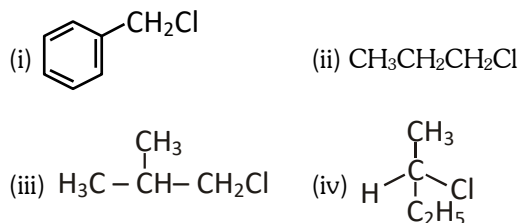
83. In the Kjeldahl's method for estimation of nitrogen present in a soil sample, ammonia evolved from 0.75 g of sample neutralized 10 mL of 1 M H_2SO_4 . The percentage of nitrogen in the soil is :

- (1) 37.33
- (2) 45.33
- (3) 35.33
- (4) 43.33

84. What products are formed when the following compound is treated with Br_2 in the presence of FeBr_3 ?



85. Which of the following compounds will undergo racemisation when solution of KOH hydrolyses?



- (1) (i) and (ii)
- (2) (ii) and (iv)
- (3) (iii) and (iv)
- (4) (i) and (iv)

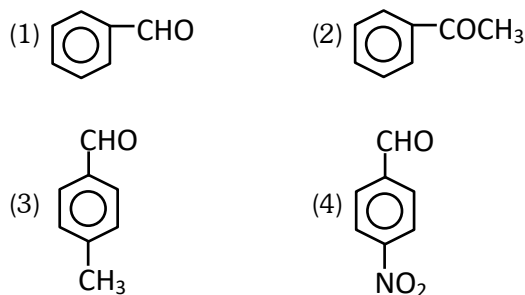
86. Among the following sets of reactants which one produces anisole?

- (1) CH_3CHO ; RMgX
- (2) $\text{C}_6\text{H}_5\text{OH}$; NaOH ; CH_3I
- (3) $\text{C}_6\text{H}_5\text{OH}$; neutral FeCl_3
- (4) $\text{C}_6\text{H}_5-\text{CH}_3$; CH_3COCl ; AlCl_3

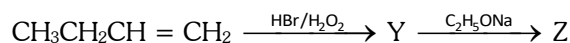
87. Which of the following will not be soluble in sodium hydrogen carbonate?

- (1) 2, 4, 6-trinitrophenol
- (2) Benzoic acid
- (3) o-Nitrophenol
- (4) Benzenesulphonic acid

88. Which one is most reactive towards Nucleophilic addition reaction?



89. Identify Z in the sequence of reactions:



- (1) $\text{CH}_3-(\text{CH}_2)_3-\text{O}-\text{CH}_2\text{CH}_3$
- (2) $(\text{CH}_3)_2\text{CH}_2-\text{O}-\text{CH}_2\text{CH}_3$
- (3) $\text{CH}_3(\text{CH}_2)_4-\text{O}-\text{CH}_3$
- (4) $\text{CH}_3\text{CH}_2-\text{CH}(\text{CH}_3)-\text{O}-\text{CH}_2\text{CH}_3$

90. Which of the following organic compounds has same hybridization as its combustion product CO_2

- (1) Ethane
- (2) Ethyne
- (3) Ethene
- (4) Ethanol

91. Which one of the following shows isogamy with non-flagellated gametes?
 (1) *Sargassum* (2) *Ectocarpus*
 (3) *Ulothrix* (4) *Spirogyra*
92. Five kingdom system of classification suggested by R.H. Whittaker is **not** based on :
 (1) Presence or absence of a well defined nucleus.
 (2) Mode of reproduction.
 (3) Mode of nutrition.
 (4) Complexity of body organisation.
93. Which one of the following fungi contains hallucinogens ?
 (1) *Morchella esculenta*
 (2) *Amanita muscaria*
 (3) *Neurospora sp.*
 (4) *Ustilago sp.*
94. Archaeobacteria differ from eubacteria in :
 (1) Cell membrane
 (2) Mode of nutrition
 (3) Cell shape
 (4) Mode of reproduction
95. Which one of the following is wrong about *Chara*?
 (1) Upper oogonium and lower round antheridium.
 (2) Globule and nucule present on the same plant.
 (3) Upper antheridium and lower oogonium
 (4) Globule is male reproductive structure
96. Which of the following is responsible for peat formation ?
 (1) *Marchantia* (2) *Riccia*
 (3) *Funaria* (4) *Sphagnum*
97. Placenta and pericarp are both edible portions in:
 (1) Apple (2) Banana
 (3) Tomato (4) Potato
98. When the margins of sepals or petals overlap one another without any particular direction, the condition is termed as :
 (1) Vexillary (2) Imbricate
 (3) Twisted (4) Valvate
99. You are given a fairly old piece of dicot stem and a dicot root. Which of the following anatomical structures will you use to distinguish between the two?
 (1) Secondary xylem
 (2) Secondary phloem
 (3) Protoxylem
 (4) Cortical cells
100. Which one of the following statements is **correct**?
 (1) The seed in grasses is not endospermic.
 (2) Mango is a parthenocarpic fruit.
 (3) A proteinaceous aleurone layer is present in maize grain.
 (4) A sterile pistil is called a staminode.
101. Tracheids differ from other tracheary elements in:
 (1) having casparian strips
 (2) being imperforate
 (3) lacking nucleus
 (4) being lignified
102. An example of edible underground stem is :
 (1) Carrot
 (2) Groundnut
 (3) Sweet potato
 (4) Potato
103. Which structures perform the function of mitochondria in bacteria ?
 (1) Nucleoid
 (2) Ribosomes
 (3) Cell wall
 (4) Mesosomes
104. The solid linear cytoskeletal elements having a diameter of 6 nm and made up of a single type of monomer are known as :
 (1) Microtubules
 (2) Microfilaments
 (3) Intermediate filaments
 (4) Lamins
105. The osmotic expansion of a cell kept in water is chiefly regulated by :
 (1) Mitochondria
 (2) Vacuoles
 (3) Plastids
 (4) Ribosomes
106. During which phase(s) of cell cycle, amount of DNA in a cell remains at 4C level if the initial amount is denoted as 2C ?
 (1) G_0 and G_1 (2) G_1 and S
 (3) Only G_2 (4) G_2 and M

107. Match the following and select the **correct** answer :

- | | |
|-----------------|-----------------------------------|
| (a) Centriole | (i) Infoldings in mitochondria |
| (b) Chlorophyll | (ii) Thylakoids |
| (c) Cristae | (iii) Nucleic acids |
| (d) Ribozymes | (iv) Basal body cilia or flagella |

- | | (a) | (b) | (c) | (d) |
|-----|------|-------|------|-------|
| (1) | (iv) | (ii) | (i) | (iii) |
| (2) | (i) | (ii) | (iv) | (iii) |
| (3) | (i) | (iii) | (ii) | (iv) |
| (4) | (iv) | (iii) | (i) | (ii) |

108. Dr. F. Went noted that if coleoptile tips were removed and placed on agar for one hour, the agar would produce a bending when placed on one side of freshly-cut coleoptile stumps. Of what significance is this experiment ?

- (1) It made possible the isolation and exact identification of auxin.
- (2) It is the basis for quantitative determination of small amounts of growth-promoting substances.
- (3) It supports the hypothesis that IAA is auxin.
- (4) It demonstrated polar movement of auxins.

109. Deficiency symptoms of nitrogen and potassium are visible first in :

- (1) Senescent leaves
- (2) Young leaves
- (3) Roots
- (4) Buds

110. In which one of the following processes CO_2 is **not** released ?

- (1) Aerobic respiration in plants
- (2) Aerobic respiration in animals
- (3) Alcoholic fermentation
- (4) Lactate fermentation

111. Anoxygenic photosynthesis is characteristic of :

- (1) *Rhodospirillum*
- (2) *Spirogyra*
- (3) *Chlamydomonas*
- (4) *Ulva*

112. A few normal seedlings of tomato were kept in a dark room. After a few days they were found to have become white-coloured like albinos. Which of the following terms will you use to describe them?

- (1) Mutated
- (2) Embolised
- (3) Etiolated
- (4) Defoliated

113. Which one of the following growth regulators is known as stress hormone ?

- (1) Abscissic acid
- (2) Ethylene
- (3) GA_3
- (4) Indole acetic acid

114. Geitonogamy involves :

- (1) fertilization of a flower by the pollen from another flower of the same plant.
- (2) fertilization of a flower by the pollen from the same flower.
- (3) fertilization of a flower by the pollen from a flower of another plant in the same population.
- (4) fertilization of a flower by the pollen from a flower of another plant belonging to a distant population.

115. Male gametophyte with least number of cell is present in :

- (1) *Pteris*
- (2) *Funaria*
- (3) *Lilium*
- (4) *Pinus*

116. An aggregate fruit is one which develops from :

- (1) Multicarpellary syncarpous gynoecium
- (2) Multicarpellary apocarpus gynoecium
- (3) Complete inflorescence
- (4) Multicarpellary superior ovary

117. Pollen tablets are available in the market for :

- (1) In vitro fertilization
- (2) Breeding programmes
- (3) Supplementing food
- (4) Ex situ conservation

118. Function of filiform apparatus is to :-

- (1) Recognize the suitable pollen at stigma
- (2) Stimulate division of generative cell
- (3) Produce nectar
- (4) Guide the entry of pollen tube

119. Non-albuminous seed is produced in :-

- (1) Maize
- (2) Castor
- (3) Wheat
- (4) Pea

120. Which of the following shows coiled RNA strand and capsomeres?

- (1) Polio virus
- (2) Tobacco mosaic virus
- (3) Measles virus
- (4) Retrovirus

121. Which one of the following is **wrongly** matched?

- (1) Transcription – Writing information from DNA to t-RNA.
- (2) Translation – Using information in m-RNA to make protein
- (3) Repressor protein – Binds to operator to stop enzyme synthesis.
- (4) Operon – Structural genes, operator and promoter.

122. Transformation was discovered by :-
 (1) Meselson and Stahl
 (2) Hershey and Chase
 (3) Griffith
 (4) Watson and Crick
123. Fruit colour in squash is an example of :-
 (1) Recessive epistasis
 (2) Dominant epistasis
 (3) Complementary genes
 (4) Inhibitory genes
124. Viruses have :-
 (1) DNA enclosed in a protein coat
 (2) Prokaryotic nucleus
 (3) Single chromosome
 (4) Both DNA and RNA
125. The first human hormone produced by recombinant DNA technology is :-
 (1) Insulin (2) Estrogen
 (3) Thyroxin (4) Progesterone
126. An analysis of chromosomal DNA using the Southern hybridization technique **does not** use :
 (1) Electrophoresis (2) Blotting
 (3) Autoradiography (4) PCR
127. In vitro clonal propagation in plants is characterized by :-
 (1) PCR and RAPD
 (2) Northern blotting
 (3) Electrophoresis and HPLC
 (4) Microscopy
128. An alga which can be employed as food for human being is :-
 (1) *Ulothrix* (2) *Chlorella*
 (3) *Spirogyra* (4) *Polysiphonia*
129. Which vector can clone only a small fragment of DNA?
 (1) Bacterial artificial chromosome
 (2) Yeast artificial chromosome
 (3) Plasmid
 (4) Cosmid
130. An example of ex situ conservation is :-
 (1) National Park (2) Seed Bank
 (3) Wildlife Sanctuary (4) Sacred Grove
131. A location with luxuriant growth of lichens on the trees indicates that the :-
 (1) Trees are very healthy
 (2) Trees are heavily infested
 (3) Location is highly polluted
 (4) Location is not polluted

132. Match the following and select the correct option

(a)	Earthworm	(i)	Pioneer species
(b)	Succession	(ii)	Detritivore
(c)	Ecosystem service	(iii)	Natality
(d)	Population growth	(iv)	Pollination

- | | (a) | (b) | (c) | (d) |
|-----|-------|------|-------|-------|
| (1) | (i) | (ii) | (iii) | (iv) |
| (2) | (iv) | (i) | (iii) | (ii) |
| (3) | (iii) | (ii) | (iv) | (i) |
| (4) | (ii) | (i) | (iv) | (iii) |
133. A species facing extremely high risk of extinction in the immediate future is called:-
 (1) Vulnerable
 (2) Endemic
 (3) Critically Endangered
 (4) Extinct
134. The zone of atmosphere in which the ozone layer is present is called :-
 (1) Ionosphere (2) Mesosphere
 (3) Stratosphere (4) Troposphere
135. The organization which publishes the Red List of species is :-
 (1) ICFRE (2) IUCN
 (3) UNEP (4) WWF
136. Select the Taxon mentioned that represents both marine and fresh water species :-
 (1) Echinoderms (2) Ctenophora
 (3) Cephalochordata (4) Cnidaria
137. Which one of the following living organisms completely *lacks* a cell wall?
 (1) Cyanobacteria (2) Sea-fan(Gorgonia)
 (3) *Saccharomyces* (4) Blue-green algae
138. Planaria possess high capacity of :-
 (1) Metamorphosis
 (2) Regeneration
 (3) Alternation of generation
 (4) Bioluminescence
139. A marine cartilaginous fish that can produce electric current is :-
 (1) *Pristis* (2) *Torpedo*
 (3) *Trygon* (4) *Scoliodon*

140. Choose the correctly matched pair :-
 (1) Tendon—Specialized connective tissue
 (2) Adipose tissue – Dense connective tissue
 (3) Areolar tissue – Loose connective tissue
 (4) Cartilage—Loose connective tissue
141. Choose the correctly matched pair :-
 (1) Inner lining of salivary ducts – Ciliated epithelium
 (2) Moist surface of buccal cavity – Glandular epithelium
 (3) Tubular parts of nephrons – Cuboidal epithelium
 (4) Inner surface of bronchioles – Squamous epithelium
142. In 'S' phase of the cell cycle :-
 (1) Amount of DNA doubles in each cell.
 (2) Amount of DNA remains same in each cell.
 (3) Chromosome number is increased.
 (4) Amount of DNA is reduced to half in each cell.
143. The motile bacteria are able to move by :-
 (1) Fimbriae (2) Flagella
 (3) Cilia (4) Pili
144. Select the option which is **not correct** with respect to enzyme action :-
 (1) Substrate binds with enzyme at its active site.
 (2) Addition of lot of succinate does not reverse the inhibition of succinic dehydrogenase by malonate.
 (3) A non-competitive inhibitor binds the enzyme at a site distinct from that which binds the substrate.
 (4) Malonate is a competitive inhibitor of succinic dehydrogenase.
145. Which one of the following is a non - reducing carbohydrate ?
 (1) Maltose (2) Sucrose
 (3) Lactose (4) Ribose 5-phosphate
146. The enzyme recombinase is required at which stage of meiosis :
 (1) Pachytene (2) Zygotene
 (3) Diplotene (4) Diakinesis
147. The initial step in the digestion of milk in humans is carried out by ?
 (1) Lipase (2) Trypsin
 (3) Rennin (4) Pepsin
148. Fructose is absorbed into the blood through mucosa cells of intestine by the process called :
 (1) active transport
 (2) facilitated transport
 (3) simple diffusion
 (4) co-transport mechanism

149. Approximately seventy percent of carbon-dioxide absorbed by the blood will be transported to the lungs:
 (1) as bicarbonate ions
 (2) in the form of dissolved gas molecules
 (3) by binding to R.B.C.
 (4) as carbamino - haemoglobin
150. Person with blood group AB is considered as universal recipient because he has :
 (1) both A and B antigens on RBC but no antibodies in the plasma.
 (2) both A and B antibodies in the plasma.
 (3) no antigen on RBC and no antibody in the plasma.
 (4) both A and B antigens in the plasma but no antibodies.
151. How do parasympathetic neural signals affect the working of the heart ?
 (1) Reduce both heart rate and cardiac output.
 (2) Heart rate is increased without affecting the cardiac output.
 (3) Both heart rate and cardiac output increase.
 (4) Heart rate decreases but cardiac output increases.
152. Which of the following causes an increase in sodium reabsorption in the distal convoluted tubule ?
 (1) Increase in aldosterone levels
 (2) Increase in antidiuretic hormone levels
 (3) Decrease in aldosterone levels
 (4) Decrease in antidiuretic hormone levels
153. Select the correct matching of the type of the joint with the example in human skeletal system :

	Type of joint	Example
(1)	Cartilaginous joint	between frontal and parietal
(2)	Pivot joint	between third and fourth cervical vertebrae
(3)	Hinge joint	between humerus and pectoral girdle
(4)	Gliding joint	between carpals

154. Stimulation of a muscle fiber by a motor neuron occurs at :
- (1) the neuromuscular junction
 - (2) the transverse tubules
 - (3) the myofibril
 - (4) the sarcoplasmic reticulum
155. Injury localized to the hypothalamus would most likely disrupt :
- (1) short - term memory.
 - (2) co-ordination during locomotion.
 - (3) executive functions, such as decision making.
 - (4) regulation of body temperature.
156. Which one of the following statements is **not correct** ?
- (1) Retinal is the light absorbing portion of visual photo pigments.
 - (2) In retina the rods have the photopigment rhodopsin while cones have three different photopigments.
 - (3) Retinal is a derivative of Vitamin C.
 - (4) Rhodopsin is the purplish red protein present in rods only.
157. Identify the hormone with its **correct** matching of source and function :
- (1) Oxytocin - posterior pituitary, growth and maintenance of mammary glands.
 - (2) Melatonin - pineal gland, regulates the normal rhythm of sleepwake cycle.
 - (3) Progesterone - corpus-luteum, stimulation of growth and activities of female secondary sex organs.
 - (4) Atrial natriuretic factor - ventricular wall increases the blood pressure.
158. Fight-or-flight reactions cause activation of:
- (1) the parathyroid glands, leading to increased metabolic rate.
 - (2) the kidney, leading to suppression of renin-angiotensin-aldosterone pathway.
 - (3) the adrenal medulla, leading to increased secretion of epinephrine and norepinephrine.
 - (4) the pancreas leading to a reduction in the blood sugar levels.
159. The shared terminal duct of the reproductive and urinary system in the human male is :
- (1) Urethra
 - (2) Ureter
 - (3) Vas deferens
 - (4) Vasa efferentia
160. The main function of mammalian corpus luteum is to produce :
- (1) estrogen only
 - (2) progesterone
 - (3) human chorionic gonadotropin
 - (4) relaxin only
161. Select the correct option describing gonadotropin activity in a normal pregnant female :
- (1) High level of FSH and LH stimulates the thickening of endometrium.
 - (2) High level of FSH and LH facilitate implantation of the embryo.
 - (3) High level of hCG stimulates the synthesis of estrogen and progesterone.
 - (4) High level of hCG stimulates the thickening of endometrium.
162. Tubectomy is a method of sterilization in which :
- (1) small part of the fallopian tube is removed or tied up.
 - (2) ovaries are removed surgically.
 - (3) small part of vas deferens is removed or tied up.
 - (4) uterus is removed surgically.
163. Which of the following is a hormone releasing Intra Uterine Device (IUD) ?
- (1) Multiload 375
 - (2) LNG - 20
 - (3) Cervical cap
 - (4) Vault
164. Assisted reproductive technology, IVF involves transfer of :
- (1) Ovum into the fallopian tube.
 - (2) Zygote into the fallopian tube.
 - (3) Zygote into the uterus.
 - (4) Embryo with 16 blastomeres into the fallopian tube.

165. A man whose father was colour blind marries a woman who had a colour blind mother and normal father. What percentage of male children of this couple will be colour blind ?

- (1) 25% (2) 0%
(3) 50% (4) 75%

166. In a population of 1000 individuals 360 belong to genotype AA, 480 to Aa and the remaining 160 to aa. Based on this data, the frequency of allele A in the population is :-

- (1) 0.4
(2) 0.5
(3) 0.6
(4) 0.7

167. A human female with Tunner's syndrome :-

- (1) has 45 chromosomes with XO.
(2) has one additional X chromosome.
(3) exhibits male characters.
(4) is able to produce children with normal husband.

168. Select the correct option :-

	Direction of RNA synthesis	Direction of reading of the template DNA strand
(1)	5'—3'	3'—5'
(2)	3'—5'	5'—3'
(3)	5'—3'	5'—3'
(4)	3'—5'	3'—5'

169. Commonly used vectors for human genome sequencing are :-

- (1) T-DNA
(2) BAC and YAC
(3) Expression Vectors
(4) T/A Cloning Vectors

170. Forelimbs of cat, lizard used in walking; forelimbs of whale used in swimming and forelimbs of bats used in flying are an example of :-

- (1) Analogous organs
(2) Adaptive radiation
(3) Homologous organs
(4) Convergent evolution

171. Which one of the following are analogous structures :-

- (1) Wings of Bat and Wings of Pigeon.
(2) Gills of Prawn and Lungs of Man.
(3) Thorns of *Bougainvillea* and Tendrils of *Cucurbita*
(4) Flippers of Dolphin and Legs of Horse

172. Which is the particular type of drug that is obtained from the plant whose one flowering branch is shown below :-



- (1) Hallucinogen (2) Depressant
(3) Stimulant (4) Pain - killer

173. At which stage of HIV infection does one usually show symptoms of AIDS :-

- (1) Within 15 days of sexual contact with an infected person.
(2) When the infected retro virus enters host cells.
(3) When HIV damages large number of helper T-Lymphocytes.
(4) When the viral DNA is produced by reverse transcriptase.

174. To obtain virus - free healthy plants from a diseased one by tissue culture technique, which part/parts of the diseased plant will be taken :-

- (1) Apical meristem only
(2) Palisade parenchyma
(3) Both apical and axillary meristems
(4) Epidermis only

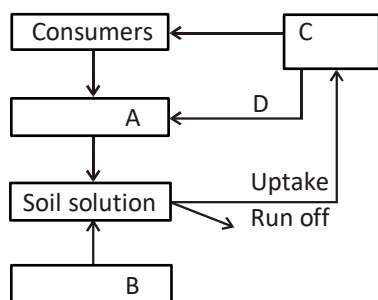
175. What gases are produced in anaerobic sludge digesters :-

- (1) Methane and CO_2 only
- (2) Methane, Hydrogen Sulphide and CO_2
- (3) Methane, Hydrogen Sulphide and O_2
- (4) Hydrogen Sulphide and CO_2

176. Just as a person moving from Delhi to Shimla to escape the heat for the duration of hot summer, thousands of migratory birds from Siberia and other extremely cold northern regions move to :-

- (1) Western Ghat
- (2) Meghalaya
- (3) Corbett National Park
- (4) Keolado National Park

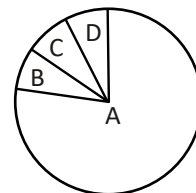
177. Given below is a simplified model of phosphorus cycling in a terrestrial ecosystem with four blanks (A-D). Identify the blanks :-



Options :

	A	B	C	D
(1)	Rock minerals	Detritus	Litter fall	Producers
(2)	Litter fall	Producers	Rock minerals	Detritus
(3)	Detritus	Rock minerals	Producer	Litter fall
(4)	Producers	Litter fall	Rock minerals	Detritus

178. Given below is the representation of the extent of global diversity of invertebrates. What groups the four portions (A-D) represent respectively :-



Options :

	A	B	C	D
(1)	Insects	Crustaceans	Other animal groups	Molluscs
(2)	Crustaceans	Insects	Molluscs	Other animal groups
(3)	Molluscs	Other animal groups	Crustaceans	Insects
(4)	Insects	Molluscs	Crustaceans	Other animal groups

179. A scrubber in the exhaust of a chemical industrial plant removes :-

- (1) gases like sulphur dioxide
- (2) particulate matter of the size 5 micrometer or above
- (3) gases like ozone and methane
- (4) particulate matter of the size 2.5 micrometer or less

180. If 20 J of energy is trapped at producer level, then how much energy will be available to peacock as food in the following chain ?

plant → mice → snake → peacock

- (1) 0.02 J
- (2) 0.002 J
- (3) 0.2 J
- (4) 0.0002 J

ANSWER KEY

AIPMT - 2014

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	4	1	4	3	3	1	2	3	4	1	3	1	2	3	4
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	1	3	4	2	1	4	3	3	2	4	2	2	3	3	3
Que.	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Ans.	4	4	2	2	4	3	4	2	2	2	3	4	3	1	4
Que.	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ans.	1	4	3	4	4	3	3	1	3	2	4	2	4	2	1
Que.	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Ans.	B	1	3	2	3	2	1	3	3	3	2	2	2	2	1
Que.	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
Ans.	4	2	4	3	4	3	4	1	3	4	2	3	4	1	2
Que.	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105
Ans.	4	B	2	1	3	4	3	2	3	3	2	4	4	2	2
Que.	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
Ans.	4	1	2	1	4	1	3	1	1	3	2	3	4	4	2
Que.	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135
Ans.	1	3	2	1	1	4	1	2	3	2	4	4	3	3	2
Que.	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
Ans.	4	2	2	2	3	3	1	2	2	2	1	3	2	1	1
Que.	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165
Ans.	1	1	4	1	4	3	2	3	1	2	3	1	2	2	3
Que.	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
Ans.	3	1	1	2	3	2	1	3	3	2	4	3	4	1	1

HINT - SHEET

1. $[\text{mass}] = \left[\frac{\text{Force}}{\text{Acceleration}} \right] = \left[\frac{\text{Force}}{\text{Velocity / time}} \right]$
 $= [F V^{-1} T]$

2. As $\text{Range} = \frac{u^2 \sin 2\theta}{g}$ so $g \propto u^2$
 Therefore $g_{\text{planet}} = \left(\frac{3}{5} \right)^2 (9.8 \text{ m/s}^2) = 3.5 \text{ m/s}^2$

3. $\vec{v}_{\text{av}} = \frac{\Delta \vec{r}}{\Delta t} = \frac{(13-2)\hat{i} + (14-3)\hat{j}}{5-0} = \frac{11}{5}(\hat{i} + \hat{j})$

4. Acceleration
 $= \frac{\text{Net force in the direction of motion}}{\text{Total mass of system}}$
 $= \frac{m_1 g - \mu(m_2 + m_3)g}{m_1 + m_2 + m_3} = \frac{g}{3}(1 - 2\mu)$

5. Change in momentum,

$$\Delta p = \int F dt$$

$$= \text{Area of F-t graph}$$

$$= \frac{1}{2} \times 2 \times 6 - 3 \times 2 + 4 \times 3$$

$$= 12 \text{ N-s}$$

6. Let upthrust of air be F_a then
 for downward motion

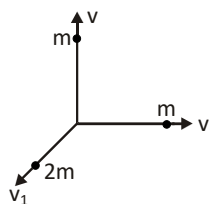
$$mg - F_a = ma$$

for upward motion

$$F_a - (m - \Delta m)g = (m - \Delta m)a$$

$$\text{Therefore } \Delta m = \frac{2ma}{g + a}$$

7.



By conservation of linear momentum

$$2mv_1 = \sqrt{2}mv \Rightarrow v_1 = \frac{v}{\sqrt{2}}$$

Total KE generated

$$\begin{aligned} &= \frac{1}{2}mv^2 + \frac{1}{2}mv^2 + \frac{1}{2}(2m)v_1^2 \\ &= mv^2 + \frac{mv^2}{2} = \frac{3}{2}mv^2 \end{aligned}$$

8. Displacement, $x = A\cos(\omega t)$

$$\text{Velocity, } v = \frac{dx}{dt} = -A\omega \sin(\omega t)$$

$$\text{Acceleration, } a = \frac{dv}{dt} = -A\omega^2 \cos(\omega t)$$

9. Here $\alpha = 2 \text{ revolutions/s}^2 = 4\pi \text{ rad/s}^2$

$$I = \frac{1}{2}MR^2 = \frac{1}{2}(50)(0.5)^2 = \frac{25}{4} \text{ Kg-m}^2$$

$$\text{As } \tau = I\alpha \text{ so } TR = I\alpha$$

$$\Rightarrow T = \frac{I\alpha}{R} = \frac{\left(\frac{25}{4}\right)(4\pi)}{(0.5)} \text{ N} = 50\pi \text{ N} = 157 \text{ N}$$

10. For rolling motion without slipping on inclined plane

$$a_1 = \frac{g \sin \theta}{1 + \frac{K^2}{R^2}}$$

and for slipping motion on inclined plane

$$a_2 = g \sin \theta$$

$$\text{Required ratio} = \frac{a_1}{a_2} = \frac{1}{1 + \frac{K^2}{R^2}} = \frac{1}{1 + \frac{5}{7}} = \frac{7}{12}$$

11. Escape velocity = $\sqrt{\frac{2GM}{R}} = c = \text{speed of light}$

$$\begin{aligned} \Rightarrow R &= \frac{2GM}{c^2} = \frac{2 \times 6.6 \times 10^{-11} \times 5.98 \times 10^{24}}{(3 \times 10^8)^2} \text{ m} \\ &= 10^{-2} \text{ m} \end{aligned}$$

$$13. Y = \frac{\frac{F}{A}}{\frac{\Delta \ell}{\ell}} \Rightarrow \Delta \ell = \frac{F\ell}{AY}$$

$$\text{But } V = A\ell \text{ so } A = \frac{V}{\ell}$$

$$\text{Therefore } \Delta \ell = \frac{F\ell^2}{VY} \propto \ell^2$$

14. As surface area decreases so energy is released.

Released energy

$$= 4\pi R^2 T [n^{1/3} - 1] \quad \text{where } R = n^{1/3}r$$

$$= 4\pi R^3 T \left[\frac{1}{r} - \frac{1}{R} \right]$$

$$= 3VT \left[\frac{1}{r} - \frac{1}{R} \right]$$

15. Heat lost = Heat gained

$$mLv + m_{sw}\Delta\theta = m_{ws}\Delta\theta$$

$$\Rightarrow m \times 540 + m \times 1 \times (100 - 80)$$

$$= 20 \times 1 \times (80 - 10)$$

$$\Rightarrow m = 2.5 \text{ g}$$

$$\text{Total mass of water} = (20 + 2.5)\text{g} = 22.5\text{g}$$

16. By Newton's law of colling

$$\frac{\theta_1 - \theta_2}{t} = k \left[\frac{\theta_1 + \theta_2}{2} - \theta_0 \right]$$

$$\Rightarrow \frac{70 - 60}{5} = k \left[\frac{70 + 60}{2} - \theta_0 \right]$$

$$\Rightarrow 2 = k[65 - \theta_0] \dots\dots\dots (i)$$

$$\text{and } \frac{60 - 54}{5} = k \left[\frac{60 + 54}{2} - \theta_0 \right]$$

$$\Rightarrow \frac{6}{5} = k[57 - \theta_0] \dots\dots\dots (ii)$$

By dividing (i) by (ii) we have

$$\frac{10}{6} = \frac{65 - \theta_0}{57 - \theta_0}$$

$$\Rightarrow \theta_0 = 45^\circ$$

17. For isothermal process $P_1V_1 = P_2V_2$

$$\Rightarrow PV = P_2(2V) \Rightarrow P_2 = \frac{P}{2}$$

For adiabatic process $P_2V_2^\gamma = P_3V_3^\gamma$

$$\Rightarrow \left(\frac{P}{2}\right)(2V)^\gamma = P_3(16V)^\gamma$$

$$\Rightarrow P_3 = \frac{P}{2} \left(\frac{1}{8}\right)^{5/3} = \frac{P}{64}$$

18. Work done by the system in the cycle
= Area under P-V curve & V-axis

$$= \frac{1}{2} (2P_0 - P_0)(2V_0 - V_0) +$$

$$\left[-\left(\frac{1}{2}\right)(3P_0 - 2P_0)(2V_0 - V_0) \right]$$

$$= \frac{P_0 V_0}{2} - \frac{P_0 V_0}{2} = 0$$

19. Mean free path $\lambda_m = \frac{1}{\sqrt{2}\pi d^2 n}$

where d = diameter of molecule

$$\Rightarrow \lambda_m \propto \frac{1}{r^2}$$

20. Total length of string $\ell = \ell_1 + \ell_2 + \ell_3$

$$\text{But frequency} \propto \frac{1}{\text{length}}$$

$$\text{so } \frac{1}{n} = \frac{1}{n_1} + \frac{1}{n_2} + \frac{1}{n_3}$$

21. Frequency COP, $f_n = (2n + 1) \frac{v}{4\ell}$

$$\text{for } n = 0, \quad f_0 = 100 \text{ Hz}$$

$$n = 1, \quad f_1 = 300 \text{ Hz}$$

$$n = 2, \quad f_2 = 500 \text{ Hz}$$

$$n = 3, \quad f_3 = 700 \text{ Hz}$$

$$n = 4, \quad f_4 = 900 \text{ Hz}$$

$$n = 5, \quad f_5 = 1100 \text{ Hz}$$

Which are less than 1250 Hz.

22. Apparent frequency

$$n' = n \left(\frac{v + v_0}{v + v_s} \right) = 1392 \left(\frac{343 + 10}{343 + 5} \right) = 1412 \text{ Hz.}$$

23. Electric field, $E \propto \frac{1}{K}$

As $K_1 < K_2$ so $E_1 > E_2$

24. At centre, $E = 0$ & $V = \frac{Q}{4\pi\epsilon_0 R}$

$$25. \quad \vec{E} = -\frac{\partial V}{\partial x} \hat{i} - \frac{\partial V}{\partial y} \hat{j} - \frac{\partial V}{\partial z} \hat{k}$$

$$= -[(6 - 8y) \hat{i} + (-8x - 8 + 6z) \hat{j} + (6y) \hat{k}]$$

$$\text{At } (1, 1, 1), \quad \vec{E} = 2\hat{i} + 10\hat{j} - 6\hat{k}$$

$$\Rightarrow |\vec{E}| = \sqrt{2^2 + 10^2 + 6^2} = \sqrt{140} = 2\sqrt{35}$$

$$\text{Force} = qE = 2 \times 2\sqrt{35} = 4\sqrt{35} \text{ N}$$

26. Resistance = $(0.5 \Omega/\text{km}) (150 \text{ km}) = 75 \Omega$

$$\text{Total voltage drop} = (8 \text{ V/km}) (150 \text{ km}) = 1200 \text{ V}$$

$$\text{Power loss} = \frac{(\Delta V)^2}{R} = \frac{(1200)^2}{75} \text{ W}$$

$$= 19200 \text{ W} = 19.2 \text{ kW}$$

$$27. \quad \frac{5}{R} = \frac{\ell_1}{100 - \ell_1} \quad \text{and} \quad \frac{5}{R/2} = \frac{1.6\ell_1}{100 - 1.6\ell_1}$$

$$\Rightarrow R = 15 \Omega$$

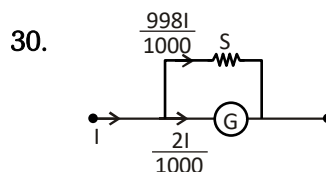
28. Internal resistance,

$$r = \left(\frac{E - V}{V} \right) R = \left(\frac{\ell_1 - \ell_2}{\ell_2} \right) R$$

$$= \left(\frac{3 - 2.85}{2.85} \right) (9.5) \Omega = 0.5 \Omega$$

29. Net magnetic moment = $2 M \cos \frac{\theta}{2}$

which is maximum for option (3)



$$V_G = V_S$$

$$\left(\frac{2I}{1000} \right) G = \left(\frac{998I}{1000} \right) S$$

$$\Rightarrow S = \frac{G}{499}$$

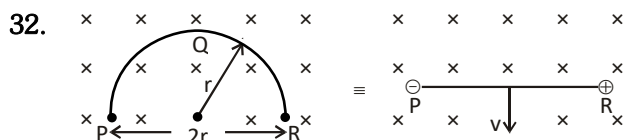
Total resistance of Ammeter

$$R = \frac{SG}{S + G} = \frac{\left(\frac{G}{499} \right) G}{\left(\frac{G}{499} \right) + G} = \frac{G}{500}$$

31. Net magnetic field, $B = \sqrt{B_1^2 + B_2^2}$

$$= \sqrt{\left(\frac{\mu_0 I_1}{2\pi d}\right)^2 + \left(\frac{\mu_0 I_2}{2\pi d}\right)^2}$$

$$= \frac{\mu_0}{2\pi d} \sqrt{I_1^2 + I_2^2}$$



Induced emf $= Bv(2r) = 2rBv$

33. $\eta = \frac{V_S I_S}{V_P I_P} \Rightarrow 0.9 = \frac{V_S(6)}{3 \times 10^3} \Rightarrow V_S = 450V$

As $V_P I_P = 3000$ so $I_P = \frac{3000}{200} A = 15A$

34. Average force $F_{av} = \frac{\Delta p}{\Delta t} = \frac{2IA}{c}$

$$= \frac{2 \times 25 \times 10^4 \times 15 \times 10^{-4}}{3 \times 10^8}$$

$$= 2.50 \times 10^{-6} N$$

35. Width of central bright fringe

$$= \frac{2\lambda D}{a} = \frac{2 \times 600 \times 10^{-9} \times 2}{1 \times 10^{-3}} m$$

$$= 2.4 \times 10^{-3} m$$

$$= 2.4 mm$$

36. For path difference λ , phase difference $= 2\pi$ rad

For path difference $\frac{\lambda}{4}$, phase difference $= \frac{\pi}{2}$ rad

As $K = 4I_0$ so intensity at given point where path

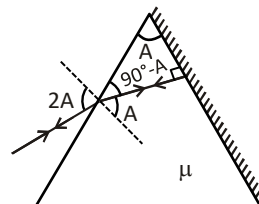
difference is $\frac{\lambda}{4}$

$$K' = 4I_0 \cos^2\left(\frac{\pi}{4}\right) = 2I_0 = \frac{K}{2}$$

37. Magnifying power of Microscope $= \frac{LD}{f_0 f_e} \propto \frac{1}{f_0}$

Magnifying power of Telescope $= \frac{f_0}{f_e} \propto f_0$

38.



By Snell's law

$$(1) \sin 2A = (\mu) \sin A \Rightarrow \mu = 2 \cos A$$

39. By using $h\nu = \phi_0 + K_{\max}$

We have

$$h\nu = \phi_0 + 0.5 \dots\dots\dots (i)$$

$$\text{and } 1.2h\nu = \phi_0 + 0.8 \dots\dots\dots (ii)$$

Therefore $\phi_0 = 1.0 eV$

40. $\lambda = \frac{h}{\sqrt{2mK}}$

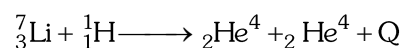
$$\frac{\lambda_1}{\lambda_2} = \sqrt{\frac{K_2}{K_1}} = \sqrt{\frac{16K}{K}} = \frac{4}{1}$$

$$\text{Percentage change} = \frac{1-4}{4} \times 100$$

$$= -75\%$$

42. BE of ${}_2\text{He}^4 = 4 \times 7.06 = 28.24 \text{ MeV}$

$$\text{BE of } {}_3\text{Li}^7 = 7 \times 5.60 = 39.20 \text{ MeV}$$



$$39.20 \qquad 28.24 \times 2$$

$$Q = 56.48 - 39.20 = 17.28 \text{ MeV}$$

43. As $\frac{N_x}{N_y} = \frac{1}{7} \Rightarrow \frac{N_x}{N_x + N_y} = \frac{1}{8} = \left(\frac{1}{2}\right)^3$

so $t = 3T_{1/2} = 3 \times 1.4 \times 10^9 \text{ yrs.}$

$= 4.2 \times 10^9 \text{ yrs.}$

46. $n = 3, \ell = 1, m = 0$

Orbital is $3p_z$.

47. $E = \frac{hc}{\lambda} = \frac{6.63 \times 10^{-34} \times 3 \times 10^8}{45 \times 10^{-9}}$

$E = 4.42 \times 10^{-18} \text{ J}$

48. According to Avogadro's hypothesis volume \propto moles

$n_{H_2} = \frac{w}{2}$

$n_{O_2} = \frac{w}{32}$

$n_{CH_4} = \frac{w}{16}$

So, ratio is $\frac{w}{2} : \frac{w}{32} : \frac{w}{16}$

$= 16 : 1 : 2$

49. The distance between the body centred atom and

one corner atom is $\frac{\sqrt{3}a}{2}$

50. Tyndall effect is optical property.

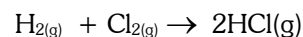
51. Na_2CO_3 will give highest pH in water because it is salt of strong base and weak acid

52. Depression in freezing point \propto vant Hoff's factor

(i) for $Al_2(SO_4)_3 \rightarrow i = 5$

53. $n_{H_2} = \frac{V(L)}{22.4L} = \frac{22.4}{22.4} = 1$

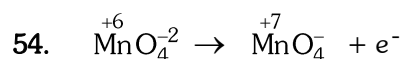
$n_{Cl_2} = \frac{11.2}{22.4} = 0.5 \text{ mole}$



initially - 1mole 0.5 mole 0

after reaction (1-0.5) 0.5 \times 2

$= 0.5 \text{ mole } 0 = 1 \text{ mole}$



0.1 mole 0.1 mole

charge required = $0.1 F = 0.1 \times 96500$

$= 9650 \text{ C}$

55. $\Delta G^\circ = -2.303 RT \log K_{sp}$

$63.3 \times 1000 = -2.303 \times 8.314 \times 298 \log K_{sp}$

$\log K_{sp} = -11.09$

$K_{sp} = 10^{-11.09} = 8 \times 10^{-12}$

56. According to faraday's 2nd law

$\frac{w_{Ag}}{E_{Ag}} = \frac{w_{O_2}}{E_{O_2}}$

$\frac{w_{Ag}}{108} = \frac{\left(\frac{5600}{22400}\right) \times 32}{8}$

$\therefore w_{Ag} = 108g$

57. During adsorption entropy decreases, so $\Delta S < 0$.

$\Delta G = \Delta H - T\Delta S$

For spontaneous adsorption $\Delta G < 0$ so ΔH should be highly negative.

58. According to Le-Chatelier's Principle

→ In exothermic reactions low temperature favours the forward reaction

→ On increasing pressure equilibrium shifts towards less number of moles.



$$\Delta H = \Delta U + \Delta n_g RT$$

$$= 2.1 + 2 \times \frac{2}{1000} \times 300$$

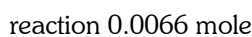
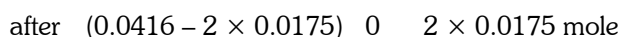
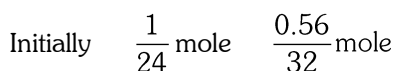
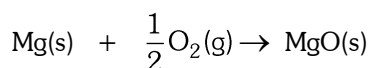
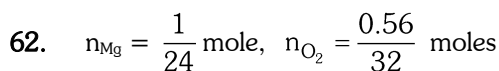
$$\Delta H = 3.3 \text{ kcal}$$

$$\Delta G = \Delta H - T \Delta S$$

$$= 3.3 - 300 \times \frac{20}{1000}; \Delta G = -2.7 \text{ Kcal}$$

60. In exothermic reactions on increasing temperature value of K_p decreases.

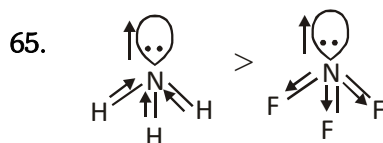
$$\text{So, } K_p > K_p'$$



$$\therefore \text{mass of Mg} = 0.0066 \times 24g = 0.16 g$$

63. Both are reducing agent

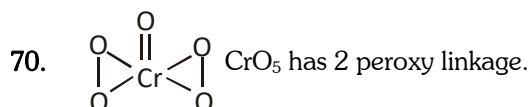
64. Be^{+2} & Li^+ both have 2 electron.



$$\mu = 1.4 \text{ D} \quad 0.23 \text{ D}$$

66. NO_3^- has sp^2 hybridisation i.e. has planar shape.

67. On moving down the group bond length increases so liberation tendency of H will be more.



71. $KMnO_4$ is a strong oxidising agent & will oxidise H_2O_2 to O_2 .

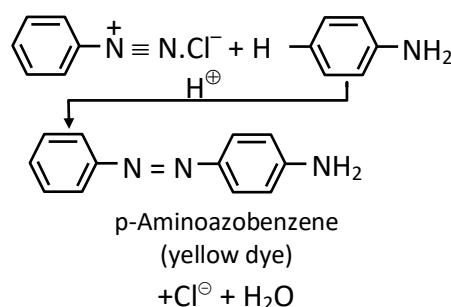
72. Due to d^5 configuration and H_2O is a weak ligand.

73. Ni^{+2} has two unpaired electron. ($3d^8$ configuration)

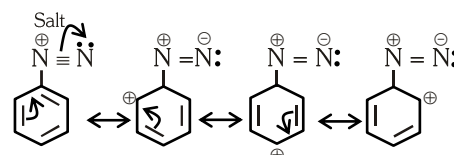
74. Cis-platin is used as an anticancer agent.

75. Due to poor shielding of f-orbitals, nucleus will exert a strong attraction, Causes lanthanoid contraction.

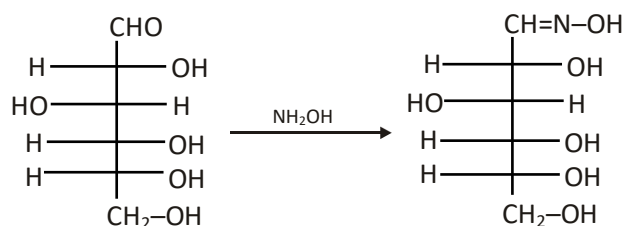
76. This is an example of electrophilic substitution reaction [coupling reaction]



77. Primary aliphatic amines form highly unstable alkyl diazonium salts. Primary aromatic amines form arene diazonium salts which are stable for a short time in solution at low temperature (273 – 278 K). The stability of arene diazonium can be explained on the basis of resonance.



78. Glucose reacts with hydroxyl amine to form an oxime.

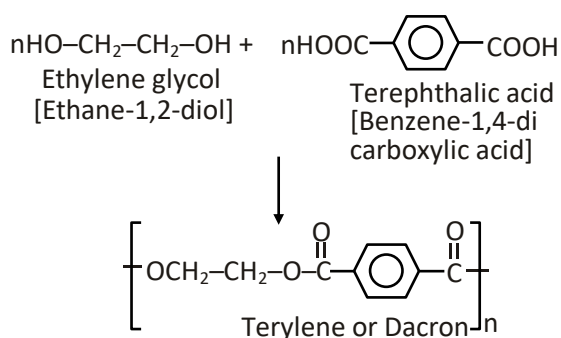


D(+)-glucose

79. Adrenaline commonly known as fight or flight hormone, it is produced by the adrenal glands after receiving a message from the brain that a stressful situation has presented itself.

80. Thermosetting polymers are cross linked or heavily branched molecules, which on heating undergo extensive cross linking in moulds and again become infusible. Most common example is bakelite.

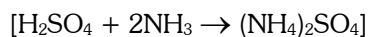
81. Dacron or terylene is the best known example of polyesters. It is manufactured by heating a mixture of ethylene glycol and terephthalic acid at 420 to 460 K in the presence of zinc acetate-antimony trioxide catalyst.



82. The common components of photochemical smog are ozone, nitric oxide, acrolein, formaldehyde and peroxyacetyl nitrate (PAN). Hence chlorofluoro carbon is not common component of photochemical smog.

83. $\therefore M \times V \text{ (ml)} = m \text{ mol}$

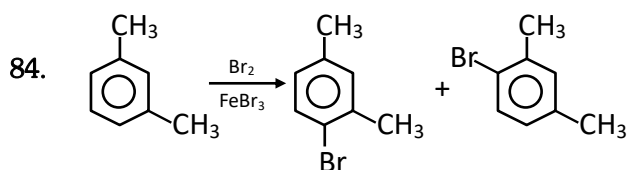
$$10 \text{ m mol H}_2\text{SO}_4 = 20 \text{ m mol of NH}_3$$



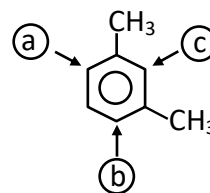
1 mol NH_3 contains 14 g nitrogen

$20 \times 10^{-3} \text{ mol NH}_3$ contains $14 \times 20 \times 10^{-3}$ nitrogen 0.75 g of sample contains

$$\% \text{ Nitrogen} = \frac{14 \times 20 \times 10^{-3}}{0.75} \times 100 = 37.33\%$$

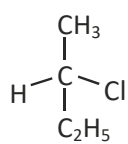


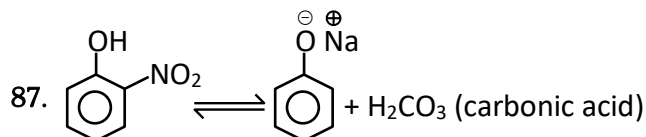
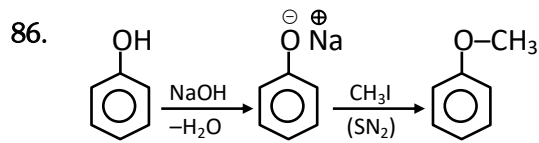
In the above compound 1,3-Dimethylbenzene, sites for the attacking electrophile are



attack of electrophile on sites (a) & (b) results in same compound as product.

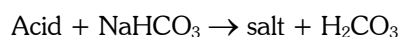
Although tendency of electrophile to attack on site (c) is very less due to high steric hinderance so respective product is favoured with very very less amount.

85. Only compound (iv)  results in formation of racemic product due to chirality.



while 2,4,6-Trinitro phenol, benzoic acid and benzene sulphonic acid are soluble in NaHCO_3 .

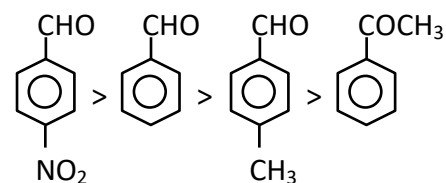
OR



Reaction is possible in forward direction if acid is more acidic than H_2CO_3 .

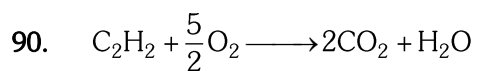
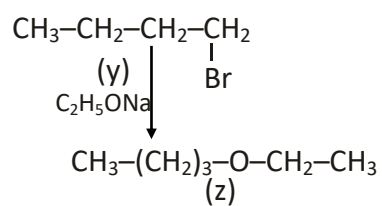
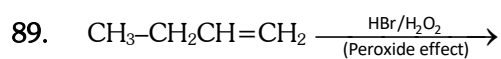
O-nitrophenol is less acidic than H_2CO_3 , hence does not soluble in sodium hydrogen carbonate.

88. Reactivity of carbonyl compounds towards NAR depends on steric and electronic effects. NAR reactivity :



-M of $-\text{NO}_2$

increase (+)ve charge on $\text{sp}^2 \text{ C}$ of $-\text{C}(=\text{O})-$



Both $\text{HC} \equiv \text{CH}$ & CO_2 has same hybridisation of carbon atom. (sp).

NEET-UG – 2013

1. In Young's double slit experiment, the slits are 2mm apart and are illuminated by photons of two wavelengths $\lambda_1 = 12000\text{\AA}$ and $\lambda_2 = 10000\text{\AA}$. At what minimum distance from the common central bright fringe on the screen 2m from the slit will a bright fringe from one interference pattern coincide with a bright fringe from the other?

(1) 3 mm (2) 8 mm (3) 6 mm (4) 4 mm

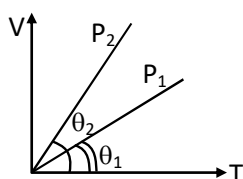
2. In a common emitter (CE) amplifier having a voltage gain G , the transistor used has transconductance 0.03 mho and current gain 25. If the above transistor is replaced with another one with transconductance 0.02 mho and current gain 20, the voltage gain will be :

(1) $\frac{5}{4}G$ (2) $\frac{2}{3}G$ (3) 1.5 G (4) $\frac{1}{3}G$

3. A certain mass of Hydrogen is changed to Helium by the process of fusion. The mass defect in fusion reaction is 0.02866 u. The energy liberated per u is : (given 1u = 931 MeV)

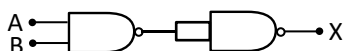
(1) 13.35 MeV (2) 2.67 MeV
(3) 26.7 MeV (4) 6.675 MeV

4. In the given ($V - T$) diagram, what is the relation between pressure P_1 and P_2 ?



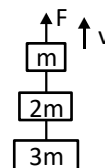
(1) Cannot be predicted (2) $P_2 = P_1$
(3) $P_2 > P_1$ (4) $P_2 < P_1$

5. The output (X) of the logic circuit shown in figure will be :



(1) $X = \overline{A+B}$ (2) $X = \overline{\overline{A} \cdot \overline{B}}$
(3) $X = \overline{A \cdot B}$ (4) $X = A \cdot B$

6. Three blocks with masses m , $2m$ and $3m$ are connected by strings, as shown in the figure. After an upward force F is applied on block m , the masses move upward at constant speed v . What is the net force on the block of mass $2m$? (g is the acceleration due to gravity)



(1) 6 mg (2) zero (3) 2 mg (4) 3 mg

7. In a n-type semiconductor, which of the following statement is true:

(1) Holes are majority carriers and trivalent atoms are dopants.
(2) Electrons are majority carriers and trivalent atoms are dopants.
(3) Electron are minority carriers and pentavalent atoms are dopants
(4) Holes are minority carriers and pentavalent atoms are dopants.

8. The half life of a radioactive isotope 'X' is 20 years. It decays to another element 'Y' which is stable. The two elements 'X' and 'Y' were found to be in the ratio 1 : 7 in a sample of a given rock. The age of the rock is estimated to be:

(1) 100 years (2) 40 years
(3) 60 years (4) 80 years

9. The molar specific heats of an ideal gas at constant pressure and volume are denoted by C_P and C_V , respectively. If $\gamma = \frac{C_P}{C_V}$ and R is the universal gas constant, then C_V is equal to :

(1) γR (2) $\frac{1+\gamma}{1-\gamma}$
(3) $\frac{R}{(\gamma-1)}$ (4) $\frac{(\gamma-1)}{R}$

10. The wavelength λ_e of an electron and λ_p of a photon of same energy E are related by:

(1) $\lambda_p \propto \frac{1}{\sqrt{\lambda_e}}$ (2) $\lambda_p \propto \lambda_e^2$

(3) $\lambda_p \propto \lambda_e$ (4) $\lambda_p \propto \sqrt{\lambda_e}$

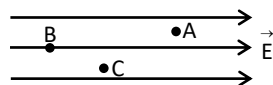
11. Ratio of longest wavelengths corresponding to Lyman and Balmer series in hydrogen spectrum is:-

(1) $\frac{9}{31}$ (2) $\frac{5}{27}$ (3) $\frac{3}{23}$ (4) $\frac{7}{29}$

12. A current loop in a magnetic field :-

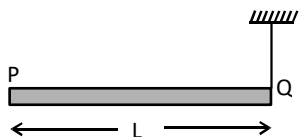
- (1) Can be in equilibrium in two orientations, one stable while the other is unstable.
- (2) Experiences a torque whether the field is uniform or non uniform in all orientations
- (3) Can be in equilibrium in one orientation
- (4) Can be in equilibrium in two orientations, both the equilibrium states are unstable

13. A, B and C are three points in a uniform electric field. The electric potential is :-



- (1) Same at all the three points A, B and C
- (2) Maximum at A
- (3) Maximum at B
- (4) Maximum at C

14. A rod PQ of mass M and length L is hinged at end P. The rod is kept horizontal by a massless string tied to point Q as shown in figure. When string is cut, the initial angular acceleration of the rod is :-

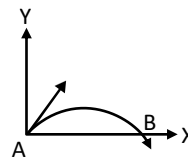


- (1) $\frac{2g}{3L}$ (2) $\frac{3g}{2L}$
- (3) g/L (4) $2g/L$

15. A wire of resistance 4Ω is stretched to twice its original length. The resistance of stretched wire would be :-

- (1) 16Ω (2) 2Ω
- (3) 4Ω (4) 8Ω

16. The velocity of a projectile at the initial point A is $(2\hat{i} + 3\hat{j})$ m/s. Its velocity (in m/s) at point B is :-



- (1) $2\hat{i} + 3\hat{j}$ (2) $-2\hat{i} - 3\hat{j}$
- (3) $-2\hat{i} + 3\hat{j}$ (4) $2\hat{i} - 3\hat{j}$

17. A body of mass ' m ' is taken from the earth's surface to the height equal to twice the radius (R) of the earth. The change in potential energy of body will be :-

- (1) $\frac{1}{3} mgR$ (2) $mg2R$
- (3) $\frac{2}{3} mgR$ (4) $3 mgR$

18. A stone falls freely under gravity. It covers distances h_1 , h_2 and h_3 in the first 5 seconds, the next 5 seconds and the next 5 seconds respectively. The relation between h_1 , h_2 and h_3 is

- (1) $h_1 = h_2 = h_3$
- (2) $h_1 = 2h_2 = 3h_3$
- (3) $h_1 = \frac{h_2}{3} = \frac{h_3}{5}$
- (4) $h_2 = 3h_1$ and $h_3 = 3h_2$

19. A bar magnet of length ' ℓ ' and magnetic dipole moment ' M ' is bent in the form of an arc as shown in figure. The new magnetic dipole moment will be



- (1) $\frac{M}{2}$ (2) M
- (3) $\frac{3}{\pi} M$ (4) $\frac{2}{\pi} M$

20. The internal resistance of a 2.1 V cell which gives a current of 0.2 A through a resistance of 10Ω is

- (1) 1.0Ω (2) 0.2Ω
- (3) 0.5Ω (4) 0.8Ω

21. For photoelectric emission from certain metal the cutoff frequency is ν . If radiation of frequency 2ν impinges on the metal plate, the maximum possible velocity of the emitted electron will be (m is the electron mass) :-

(1) $2\sqrt{h\nu/m}$ (2) $\sqrt{h\nu/(2m)}$
(3) $\sqrt{h\nu/m}$ (4) $\sqrt{2h\nu/m}$

22. During an adiabatic process, the pressure of a gas is found to be proportional to the cube of its temperature. The ratio of $\frac{C_p}{C_v}$ for the gas is :-

(1) $\frac{3}{2}$ (2) $\frac{4}{3}$
(3) 2 (4) $\frac{5}{3}$

23. The following four wires are made of the same material. Which of these will have the largest extension when the same tension is applied ?

- (1) length = 300 cm, diameter = 3mm
(2) length = 50 cm, diameter = 0.5 mm
(3) length = 100 cm, diameter = 1mm
(4) length = 200 cm, diameter = 2mm

24. The resistances of the four arms P, Q, R and S in a Wheatstone's bridge are 10 ohm, 30 ohm, 30 ohm and 90 ohm, respectively. The e.m.f. and internal resistance of the cell are 7 volt and 5 ohm respectively. If the galvanometer resistance is 50 ohm, the current drawn from the cell will be :-

(1) 2.0 A (2) 1.0 A
(3) 0.2 A (4) 0.1 A

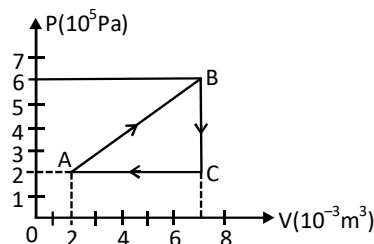
25. The amount of heat energy required to raise the temperature of 1 g of Helium at constant volume, from T_1 K to T_2 K is :-

(1) $\frac{3}{4} N_a k_B \left(\frac{T_2}{T_1} \right)$ (2) $\frac{3}{8} N_a k_B (T_2 - T_1)$
(3) $\frac{3}{2} N_a k_B (T_2 - T_1)$ (4) $\frac{3}{4} N_a k_B (T_2 - T_1)$

26. A piece of iron is heated in a flame. It first becomes dull red then becomes reddish yellow and finally turns to white hot. The correct explanation for the above observation is possible by using :-

- (1) Newton's Law of cooling
(2) Stefan's Law
(3) Wien's displacement Law
(4) Kirchoff's Law

27. A gas is taken through the cycle $A \rightarrow B \rightarrow C \rightarrow A$, as shown, What is the net work done by the gas ?



- (1) -2000 J (2) 2000 J
(3) 1000 J (4) Zero

28. The condition under which a microwave oven heats up a food item containing water molecules most efficiently is :-

- (1) Infra-red waves produce heating in a microwave oven
(2) The frequency of the microwaves must match the resonant frequency of the water molecules
(3) The frequency of the microwaves has no relation with natural frequency of water molecules
(4) Microwaves are heat waves, so always produce heating

29. An explosion breaks a rock into three parts in a horizontal plane. Two of them go off at right angles to each other. The first part of mass 1 kg moves with a speed of 12 ms^{-1} and the second part of mass 2 kg moves with 8 ms^{-1} speed. If the third part flies off with 4 ms^{-1} speed, then its mass is :-

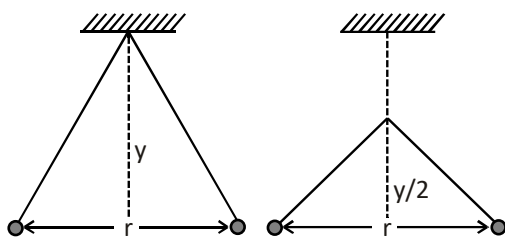
- (1) 17 kg (2) 3 kg
(3) 5 kg (4) 7 kg

- 30.** In an experiment four quantities a, b, c and d are measured with percentage error 1%, 2%, 3% and 4% respectively. Quantity P is calculated as follows $P = \frac{a^3 b^2}{cd}$ % error in P is :-
- (1) 4% (2) 14%
(3) 10% (4) 7%
- 31.** A small object of uniform density rolls up a curved surface with an initial velocity 'v'. It reaches upto a maximum height of $\frac{3v^2}{4g}$ with respect to the initial position. The object is
- (1) Disc (2) Ring
(3) Solid sphere (4) Hollow sphere
- 32.** A plano convex lens fits exactly into a plano concave lens. Their plane surfaces are parallel to each other. If lenses are made of different materials of refractive indices μ_1 and μ_2 and R is the radius of curvature of the curved surface of the lenses, then the focal length of combination is
- (1) $\frac{2R}{(\mu_2 - \mu_1)}$ (2) $\frac{R}{2(\mu_1 + \mu_2)}$
(3) $\frac{R}{2(\mu_1 - \mu_2)}$ (4) $\frac{R}{(\mu_1 - \mu_2)}$
- 33.** A parallel beam of fast moving electrons is incident normally on a narrow slit. A fluorescent screen is placed at a large distance from the slit. If the speed of the electrons is increased, which of the following statements is correct ?
- (1) The angular width of central maximum will be unaffected.
(2) Diffraction pattern is not observed on the screen in the case of electrons.
(3) The angular width of the central maximum of the diffraction pattern will increase.
(4) The angular width of the central maximum will decrease.
- 34.** For a normal eye, the cornea of eye provides a converging power of 40 D and the least converging power of the eye lens behind the cornea is 20 D. Using this information, the distance between the retina and the cornea -eye lens can be estimated to be -
- (1) 1.5 cm (2) 5 cm
(3) 2.5 cm (4) 1.67 cm
- 35.** The upper half of an inclined plane of inclination θ is perfectly smooth while lower half is rough. A block starting from rest at the top of the plane will again come to rest at the bottom, if the coefficient of friction between the block and lower half of the plane is given by:-
- (1) $\mu = \tan \theta$
(2) $\mu = \frac{1}{\tan \theta}$
(3) $\mu = \frac{2}{\tan \theta}$
(4) $\mu = 2 \tan \theta$
- 36.** A wave travelling in the +ve x-direction having displacement along y-direction as 1m, wavelength 2π m and frequency of $\frac{1}{\pi}$ Hz is represented by :
- (1) $y = \sin (2\pi x + 2\pi t)$
(2) $y = \sin (x - 2t)$
(3) $y = \sin (2\pi x - 2\pi t)$
(4) $y = \sin (10\pi x - 20\pi t)$
- 37.** A source of unknown frequency gives 4 beats/s, when sounded with a source of known frequency 250 Hz, The second harmonic of the source of unknown frequency gives five beats per second, when sounded with a source of frequency 513 Hz, The unknown frequency is
- (1) 260 Hz (2) 254 Hz
(3) 246 Hz (4) 240 Hz

38. A coil is self-inductance L is connected in series with a bulb B and an AC source. Brightness of the bulb decreases when :

- (1) an iron rod is inserted in the coil.
- (2) frequency of the AC source is decreased.
- (3) number of turns in the coil is reduced.
- (4) A capacitance of reactance $X_C = X_L$ is included in the same circuit.

39. Two pith balls carrying equal charges are suspended from a common point by strings of equal length, the equilibrium separation between them is r . Now the strings are rigidly clamped at half the height. The equilibrium separation between the balls now become :



- (1) $\left(\frac{2r}{3}\right)$
- (2) $\left(\frac{1}{\sqrt{2}}\right)^2$
- (3) $\left(\frac{r}{\sqrt{3}}\right)$
- (4) $\left(\frac{2r}{\sqrt{3}}\right)$

40. If we study the vibration of a pipe open at both ends, then the following statement is not true :

- (1) Pressure change will be maximum at both ends
- (2) Open end will be antinode
- (3) Odd harmonics of the fundamental frequency will be generated
- (4) All harmonics of the fundamental frequency will be generated

41. When a proton is released from rest in a room, it starts with an initial acceleration a_0 towards west. When it is projected towards north with a speed v_0 it moves with an initial acceleration $3a_0$ towards west. The electric and magnetic fields in the room are:

- (1) $\frac{ma_0}{e}$ east, $\frac{3ma_0}{ev_0}$ down
- (2) $\frac{ma_0}{e}$ west, $\frac{2ma_0}{ev_0}$ up
- (3) $\frac{ma_0}{e}$ west, $\frac{2ma_0}{ev_0}$ down
- (4) $\frac{ma_0}{e}$ east, $\frac{3ma_0}{ev_0}$ up

42. A wire loop is rotated in magnetic field. The frequency of change of direction of the induced e.m.f. is :

- (1) Six times per revolution
- (2) Once per revolution
- (3) twice per revolution
- (4) four times per revolution

43. A uniform force of $(3\hat{i} + \hat{j})$ newton acts on a particle of mass 2kg. Hence the particle is displaced from position $(2\hat{i} + \hat{k})$ meter to position $(4\hat{i} + 3\hat{j} - \hat{k})$ meter. The work done by the force on the particle is :-

- (1) 15 J (2) 9 J (3) 6 J (4) 13 J

44. The wettability of a surface by a liquid depends primarily on :-


- (1) angle of contact between the surface and the liquid
- (2) viscosity
- (3) surface tension
- (4) density

45. Infinite number of bodies, each of mass 2 kg are situated on x-axis at distance 1m, 2m, 4m, 8m, ..., respectively, from the origin. The resulting gravitational potential due to this system at the origin will be :

- (1) $-4G$ (2) $-G$
- (3) $-\frac{8}{3}G$ (4) $-\frac{4}{3}G$

46. The value of Planck's constant is 6.63×10^{-34} Js. The speed of light is 3×10^{17} nm s⁻¹. Which value is closest to the wavelength in nanometer of a quantum of light with frequency of 6×10^{15} s⁻¹ ?

(1) 75 (2) 10
(3) 25 (4) 50

47. The radical,  is aromatic because it has :-

(1) 6p-orbitals and 7 unpaired electrons
(2) 6p-orbitals and 6 unpaired electrons
(3) 7p-orbitals and 6 unpaired electrons
(4) 7p-orbitals and 7 unpaired electrons

48. Which of the following is electron-deficient?

(1) PH₃ (2) (CH₃)₂
(3) (SiH₃)₂ (4) (BH₃)₂

49. Which of the following statements about the interstitial compounds is **incorrect** ?

(1) They have higher melting points than the pure metal
(2) They retain metallic conductivity
(3) They are chemically reactive
(4) They are much harder than the pure metal

50. How many grams of concentrated nitric acid solution should be used to prepare 250 mL of 2.0 M HNO₃? (70% by mass)

(1) 54.0 g
(2) 45.0 g
(3) 90.0 g
(4) 70.0 g

51. Which of the following lanthanoid ions is diamagnetic?

(Atomic number Ce = 58, Sm = 62, Yb = 70, Eu = 63)

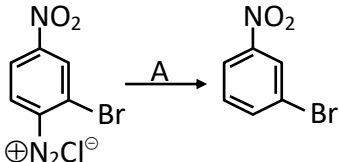
(1) Yb²⁺ (2) Ce²⁺
(3) Sm²⁺ (4) Eu²⁺

52. Which one of the following molecules contains no π bond ?

(1) NO₂ (2) CO₂ (3) H₂O (4) SO₂

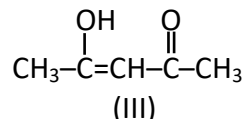
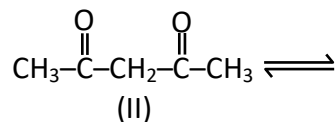
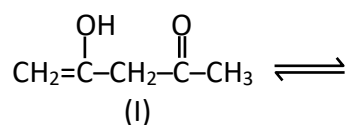
53. Based on equation $E = -2.178 \times 10^{-18} \text{ J} \left(\frac{Z^2}{n^2} \right)$ certain conclusions are written. Which of them is **not** correct ?

(1) For $n = 1$, the electron has a more negative energy than it does for $n = 6$ which means that the electron is more lossely bound in the smallest allowed orbit.
(2) The negative sign in equation simply means that the energy of electron bound to the nucleus is lower than it would be if the electrons were at the infinite distance from the nucleus
(3) Larger the value of n , the larger is the orbit radius
(4) Equation can be used to calculate the change in energy when the electron change orbit

54. In the reaction  A is

(1) H⁺/H₂O (2) HgSO₄/H₂SO₄
(3) Cu₂Cl₂ (4) H₃PO₂ and H₂O

55. The order of stability of the following tautomeric compounds is :-



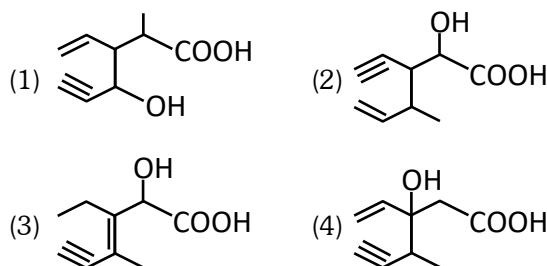
(1) II > III > I (2) I > II > III
(3) III > II > I (4) II > I > III

56. Nylon is an example of :-

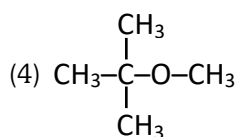
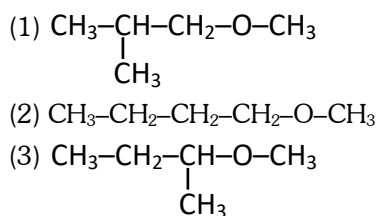
(1) Polythene (2) Polyester
(3) Polysaccharide (4) Polyamide

57. XeF_2 is isostructural with :-
 (1) BaCl_2 (2) TeF_2 (3) ICl_2^- (4) SbCl_3
58. The basic structural unit of silicates is :-
 (1) SiO_4^{2-} (2) SiO^- (3) SiO_4^{4-} (4) SiO_3^{2-}
59. Which of the following structure is similar to graphite?
 (1) B_2H_6 (2) BN (3) B (4) B_4C
60. The structure of isobutyl group in an organic compound is :-
 (1) $\text{CH}_3-\overset{\text{CH}_3}{\underset{\text{CH}_3}{\text{C}}}-$ (2) $\text{CH}_3-\text{CH}_2-\text{CH}_2-$
 (3) $\text{CH}_3-\text{CH}-\text{CH}_2-\text{CH}_3$ (4) $\text{CH}_3-\text{CH}_2-\text{CH}_2-\text{CH}_2-$
61. The number of carbon atoms per unit cell of diamond unit cell is :-
 (1) 1 (2) 4 (3) 8 (4) 6
62. An excess of AgNO_3 is added to 100 mL of a 0.01 M solution of dichlorotetraaquachromium(III) chloride. The number of moles of AgCl precipitated would be :-
 (1) 0.01 (2) 0.001
 (3) 0.002 (4) 0.003
63. What is the maximum numbers of electrons that can be associated with the following set of quantum numbers? $n = 3, l = 1$ and $m = -1$
 (1) 2 (2) 10 (3) 6 (4) 4
64. Which of these is not a monomer for a high molecular mass silicone polymer?
 (1) PhSiCl_3 (2) MeSiCl_3
 (3) Me_2SiCl_2 (4) Me_3SiCl
65. A reaction having equal energies of activation for forward and reverse reactions has :-
 (1) $\Delta H = \Delta G = \Delta S = 0$ (2) $\Delta S = 0$
 (3) $\Delta G = 0$ (4) $\Delta H = 0$
66. At 25°C molar conductance of 0.1 molar aqueous solution of ammonium hydroxide is $9.54 \text{ ohm}^{-1} \text{ cm}^2 \text{ mol}^{-1}$ and at infinite dilution its molar conductance is $238 \text{ ohm}^{-1} \text{ cm}^2 \text{ mol}^{-1}$. The degree of ionisation of ammonium hydroxide at the same concentration and temperature is :-
 (1) 40.800% (2) 2.080%
 (3) 20.800% (4) 4.008%

67. Structure of the compound whose IUPAC name is 3-Ethyl-2-hydroxy-4-methylhex-3-en-5-ynoic acid is :-



68. Among the following ethers, which one will produce methyl alcohol on treatment with hot concentrated HI ?



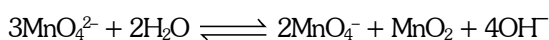
69. Antiseptics and disinfectants either kill or prevent growth of microorganisms. Identify which of the following statements is **not true** :-

- (1) Disinfectants harm the living tissues
 (2) A 0.2% solution of phenol is an antiseptic while 1% solution acts as a disinfectant
 (3) Chlorine and Iodine are used as strong disinfectants
 (4) Dilute solutions of Boric acid and Hydrogen Peroxide are strong antiseptics

70. A magnetic moment of 1.73 BM will be shown by one among the following :-



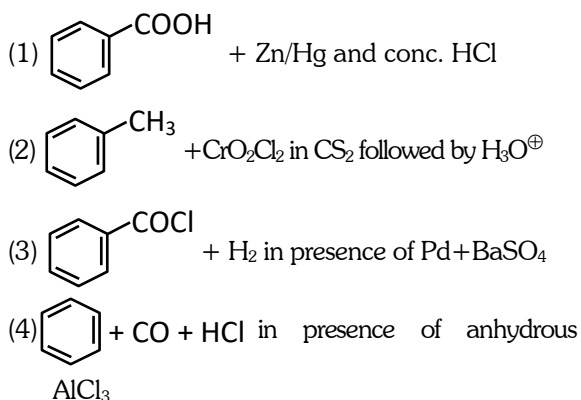
71. KMnO_4 can be prepared from K_2MnO_4 as per the reaction :-



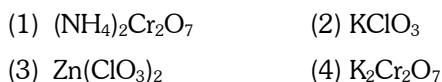
The reaction can go to completion by removing OH^- ions by adding :-

- (1) SO_2 (2) HCl (3) KOH (4) CO_2

72. Reaction by which Benzaldehyde cannot be prepared :-



73. Which of the following does not give oxygen on heating ?

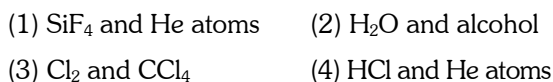


74. A metal has a fcc lattice. The edge length of the unit cell is 404 pm. The density of the metal is 2.72g cm⁻³. The molar mass of the metal is :-

(Avogadro's constant N_A = 6.02 × 10²³)



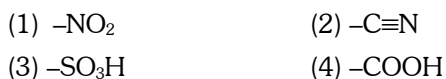
75. Dipole induced dipole interactions are present in which of the following pairs :-



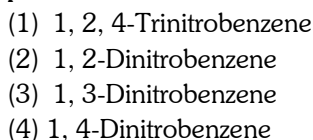
76. Roasting of sulphides gives the gas X as a by product. This is colourless gas with choking smell of burnt sulphur and causes great damage to respiratory organs as a result of acid rain. Its aqueous solution is acidic, acts as reducing agent and its acid has never been isolated. The gas X is



77. Some meta-directing substituents in aromatic substitution are given. Which one is most deactivating?



78. Nitrobenzene on reaction with conc. HNO₃/H₂SO₄ at 80-100°C forms which one of the following products ?



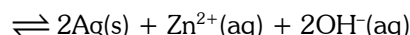
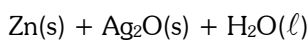
79. A hydrogen gas electrode is made by dipping platinum wire in a solution of HCl of pH = 10 and by passing hydrogen gas around the platinum wire at one atm pressure. The oxidation potential of electrode would be ?



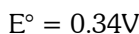
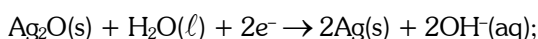
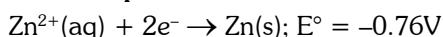
80. Which of the following is a polar molecule ?



81. A button cell used in watches function as following



If half cell potentials are



The cell potential will be :-



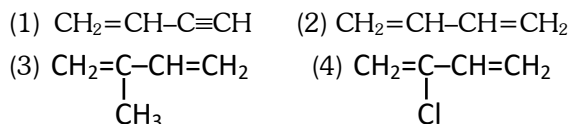
82. Which of these is **least likely** to act as a Lewis base?



83. Which of the following compounds will not undergo Friedel-Craft's reaction easily :-



84. Which is the monomer of Neoprene in the following ?



85. 6.02 × 10²⁰ molecules of urea are present in 100mL of its solution. The concentration of solution is :-



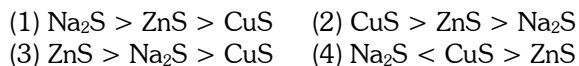
86. Maximum deviation from ideal gas is expected from :



87. Which of the following is paramagnetic ?



88. Identify the correct order of solubility in aqueous medium :



89. What is the activation energy for a reaction if its rate doubles when the temperature is raised from 20°C to 35°C ? (R = 8.314 J mol⁻¹ K⁻¹)

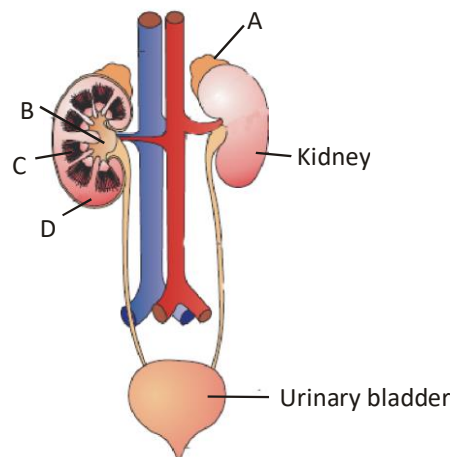


90. Which is the strongest acid in the following?



- 91.** The eye of octopus and eye of cat show different patterns of structure, yet they perform similar function. This is an example of:
- (1) Analogous organs that have evolved due to divergent evolution
 - (2) Homologous organs that have evolved due to convergent evolution
 - (3) Homologous organs that have evolved due to divergent evolution
 - (4) Analogous organs that have evolved due to convergent evolution
- 92.** Select the correct statement with respect to locomotion in humans:
- (1) The joint between adjacent vertebrae is a fibrous joint
 - (2) A decreased level of progesterone causes osteoporosis in old people
 - (3) Accumulation of uric acid crystals in joints causes their inflammation
 - (4) The vertebral column has 10 thoracic vertebrae
- 93.** A phosphoglyceride is always made up of :
- (1) a saturated or unsaturated fatty acid esterified to a phosphate group which is also attached to a glycerol molecule
 - (2) only a saturated fatty acid esterified to a glycerol molecule to which a phosphate group is also attached
 - (3) only a unsaturated fatty acid esterified to a glycerol molecule to which a phosphate group is also attached
 - (4) a saturated or unsaturated fatty acid esterified to a glycerol molecule to which a phosphate group is also attached
- 94.** Perisperm differs from endosperm in:
- (1) its formation by fusion of secondary nucleus with several sperms
 - (2) being a haploid tissue
 - (3) having no reserve food
 - (4) being a diploid tissue
- 95.** A sedentary sea anemone gets attached to the shell lining of hermit crab. The association is :
- (1) Amensalism
 - (2) Ectoparasitism
 - (3) Symbiosis
 - (4) Commensalism

- 96.** The cell-mediated immunity inside the human body is carried out by :
- (1) Erythrocytes
 - (2) T-lymphocytes
 - (3) B-lymphocytes
 - (4) Thrombocytes
- 97.** Which of the following are likely to be present in deep sea water ?
- (1) Saprophytic fungi
 - (2) Archaeobacteria
 - (3) Eubacteria
 - (4) Blue-green algae
- 98.** One of the representatives of Phylum Arthropoda is :
- (1) flying fish
 - (2) cuttlefish
 - (3) silverfish
 - (4) pufferfish
- 99.** Megasporangium is equivalent to :
- (1) Ovule
 - (2) Embryo sac
 - (3) Fruit
 - (4) Nucellus
- 100.** Kyoto Protocol was endorsed at :
- (1) CoP - 4
 - (2) CoP - 3
 - (3) CoP - 5
 - (4) CoP - 6
- 101.** Figure shows human urinary system with structures labelled A to D. Select option which correctly identifies them and gives their characteristics and/or functions.



- (1) D-Cortex - outer part of kidney and do not contain any part of nephrons
- (2) A-Adrenal gland - located at the anterior part of kidney. Secrete Catecholamines which stimulate glycogen breakdown
- (3) B-Pelvis - broad funnel shaped space inner to hilum, directly connected to loops of Henle
- (4) C-Medulla-inner zone of kidney and contains complete nephrons

102. In china rose the flowers are :

- (1) Zygomorphic, epigynous with twisted aestivation
- (2) Actinomorphic, hypogynous with twisted aestivation
- (3) Actinomorphic, epigynous with valvate aestivation
- (4) Zygomorphic, hypogynous with imbricate aestivation

103. The Golgi complex plays a major role :

- (1) in post translational modification of proteins and glycosidation of lipids
- (2) in trapping the light and transforming it into chemical energy
- (3) in digesting proteins and carbohydrates
- (4) as energy transferring organelles

104. What external changes are visible after the last moult of a cockroach nymph?

- (1) Labium develops
- (2) Mandibles become harder
- (3) Anal cerci develop
- (4) Both fore wings with hind wings develop

105. Isogamous condition with non-flagallated gametes is found in :

- (1) *Fucus*
- (2) *Chlamydomonas*
- (3) *Spirogyra*
- (4) *Volvox*

106. Transition state structure of the substrate formed during an enzymatic reaction is :

- (1) permanent and stable
- (2) transient but stable
- (3) permanent but unstable
- (4) transient and unstable

107. Select the answer which correctly matches the endocrine gland with the hormone it secretes and its function/deficiency symptom:

	Endocrine gland	Hormone	Function/deficiency symptoms
(1)	Corpus luteum	Testosterone	Stimulates spermatogenesis
(2)	Anterior pituitary	Oxytocin	Stimulates uterus contraction during child birth
(3)	Posterior pituitary	Growth Hormone (GH)	Oversecretion stimulates abnormal growth
(4)	Thyroid gland	Thyroxine	Lack of iodine in diet results in goitre

108. The colonies of recombinant bacteria appear white in contrast to blue colonies of non-recombinant bacteria because of :

- (1) Inactivation of glycosidase enzyme in recombinant bacteria
- (2) Non-recombinant bacteria containing beta-galactosidase
- (3) Insertional inactivation of alpha-galactosidase in non-recombinant bacteria
- (4) Insertional inactivation of beta-galactosidase in recombinant bacteria

109. Monoecious plant of *Chara* shows occurrence of

- (1) upper oogonium and lower antheridium on the same plant
- (2) antheridiophore and archegoniophore on the same plant
- (3) stamen and carpel on the same plant
- (4) upper antheridium and lower oogonium on the same plant

110. Advantage of cleistogamy is :-

- (1) Vivipary
- (2) Higher genetic variability
- (3) More vigorous offspring
- (4) No dependence on pollinators

111. The H-zone in the skeletal muscle fibre is due to :

- (1) extension of myosin filaments in the central portion of the A-band
- (2) the absence of myofibrils in the central portion of A-band
- (3) the central gap between myosin filaments in the A-band
- (4) the central gap between actin filaments extending through myosin filaments in the A-band

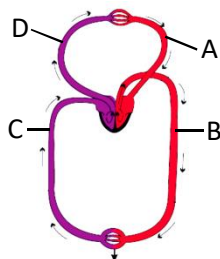
112. Artificial insemination means :

- (1) introduction of sperms of a healthy donor directly into the ovary
- (2) transfer of sperms of a healthy donor to a test tube containing ova
- (3) transfer of sperms of husband to a test tube containing ova
- (4) artificial introduction of sperms of a healthy donor into the vagina

113. Which group of animals belong to the same phylum?

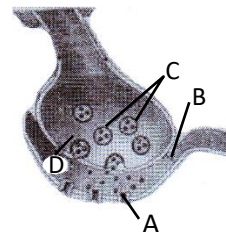
- (1) Sponge, Sea anemone, Starfish
- (2) Malarial parasite, *Amoeba*, Mosquito
- (3) Earthworm, Pinworm, Tapeworm
- (4) Prawn, Scorpion, *Locusta*

114. Seed coat is **not** thin, membranous in :
 (1) Gram (2) Maize
 (3) Coconut (4) Groundnut
115. If two persons with 'AB' blood group marry and have sufficiently large number of children, these children could be classified as 'A' blood group : 'AB' blood group 'B' blood group in 1 : 2 : 1 ratio. Modern technique of protein electrophoresis reveals presence of both 'A' and 'B' type proteins in 'AB' blood group individuals. This is an example of :
 (1) Complete dominance
 (2) Codominance
 (3) Incomplete dominance
 (4) Partial dominance
116. Which of the following **cannot** be detected in a developing foetus by amniocentesis ?
 (1) Jaundice
 (2) Klinefelter syndrome
 (3) Sex of the foetus
 (4) Down syndrome
117. The first stable product of fixation of atmospheric nitrogen in leguminous plants is :
 (1) Glutamate (2) NO_2^-
 (3) Ammonia (4) NO_3^-
118. A biologist studied the population of rats in a barn. He found that the average natality was 250, average mortality 240, immigration 20 and emigration 30. The net increase in population is
 (1) Zero (2) 10 (3) 15 (4) 05
119. Secondary productivity is rate of formation of new organic matter by :
 (1) Decomposer (2) Producer
 (3) Parasite (4) Consumer
120. Infection of *Ascaris* usually occurs by :
 (1) mosquito bite
 (2) drinking water containing eggs of *Ascaris*
 (3) eating imperfectly cooked pork.
 (4) Tse-tse fly
121. Figure shows schematic plan of blood circulation in humans with labels A to D, Identify the label and give its function/s.



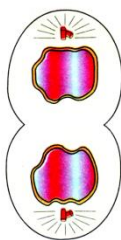
- (1) D-Dorsal aorta-takes blood from heart to body parts, $\text{PO}_2 = 95 \text{ mm Hg}$
 (2) A-Pulmonary vein-takes impure blood from body parts, $\text{PO}_2 = 60 \text{ mm Hg}$
 (3) B-Pulmonary artery-takes blood from heart to lungs, $\text{PO}_2 = 90 \text{ mm Hg}$
 (4) C-Vena Cava-takes blood from body parts the right auricle, $\text{PCO}_2 = 45 \text{ mm Hg}$

122. The tendency of population to remain in genetic equilibrium may be disturbed by :
 (1) lack of random mating
 (2) random mating
 (3) lack of migration
 (4) lack of mutations
123. A diagram showing axon terminal and synapse is given below. Identify correctly at least two of A-D.



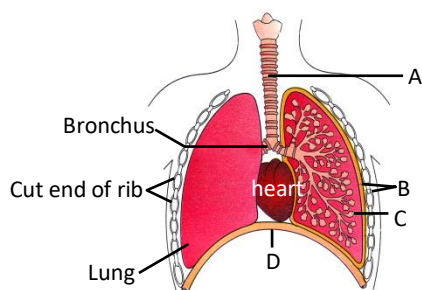
- (1) C-Neurotransmitter
 D- Ca^{++}
 (2) A-Receptor
 C-Synaptic vesicles
 (3) B-Synaptic connection
 D- K^+
 (4) A-Neurotransmitter
 B-Synaptic cleft
124. A good producer of citric acid is :
 (1) *Saccharomyces* (2) *Aspergillus*
 (3) *Pseudomonas* (4) *Clostridium*
125. Age of a tree can be estimated by :
 (1) diameter of its heartwood
 (2) its height and girth
 (3) biomass
 (4) number of annual rings
126. The process by which organisms with different evolutionary history evolve similar phenotypic adaptation in response to a common environmental challenge, is called:
 (1) Adaptive radiation
 (2) Natural selection
 (3) Convergent evolution
 (4) Non-random evolution

127. A stage in cell division is shown in the figure. Select the answer which gives correct identification of the stage with its characteristics.



(1)	Telophase	Endoplasmic reticulum and nucleolus not reformed yet.
(2)	Telophase	Nuclear envelop reforms, golgi complex reforms.
(3)	Late anaphase	Chromosomes move away from equatorial plate, golgi complex not present.
(4)	Cytokinesis	Cell plate formed, mitochondria distributed between two daughter cells.

128. The figure shows a diagrammatic view of human respiratory system with labels A, B, C and D. Select the option which gives correct identification and main function and/or characteristic :-



- (1) D – Lower end of lungs – diaphragm pulls it down during inspiration
 (2) A – trachea - long tube supported by complete cartilaginous rings for conducting inspired air
 (3) B – pleural membrane - surround ribs on both sides to provide cushion against rubbing
 (4) C – Alveoli - thin walled vascular bag like structures for exchange of gases
129. Interfascicular cambium develops from the cells of:
- (1) Pericycle
 (2) Medullary rays
 (3) Xylem parenchyma
 (4) Endodermis

130. During seed germination its stored food is mobilized by :

(1) Gibberellin (2) Ethylene
 (3) Cytokinin (4) ABA

131. Meiosis takes place in :

(1) Megaspore (2) Meiocyte
 (3) Conidia (4) Gemmule

132. According to Darwin, the organic evolution is due to :

(1) Reduced feeding efficiency in one species due to the presence of interfering species
 (2) Intraspecific competition
 (3) Interspecific competition
 (4) Competition within closely related species

133. Which of the following criteria **does not** pertain to facilitated transport ?

(1) Uphill transport
 (2) Requirement of special membrane proteins
 (3) High selectivity
 (4) Transport saturation

134. A major site for synthesis of lipids is :

(1) Nucleoplasm (2) RER
 (3) SER (4) Symplast

135. Natural reservoir of phosphorus is :

(1) Fossils (2) Sea water
 (3) Animal bones (4) Rock

136. Which of the metabolites is common to respiration- mediated breakdown of fats, carbohydrates and proteins ?

(1) Acetyl CoA
 (2) Glucose-6-phosphate
 (3) Fructose 1,6-bisphosphate
 (4) Pyruvic acid

137. Which one of the following processes during decomposition is **correctly** described?

(1) Leaching – Water soluble inorganic nutrients rise to the top layers of soil
 (2) Fragmentation – Carried out by organisms such as earthworm
 (3) Humification – Leads to the accumulation of a dark coloured substance humus which undergoes microbial action at a very fast rate
 (4) Catabolism – Last step in the decomposition under fully anaerobic condition

138. If both parents are carriers for thalassemia, which is an autosomal recessive disorder, what are the chances of pregnancy resulting in an affected child?

(1) 100% (2) No chance
 (3) 50% (4) 25%

- 139.** Which of the following statements is not true of two genes that show 50% recombination frequency ?
 (1) If the genes are present on the same chromosome, they undergo more than one crossovers in every meiosis
 (2) The genes may be on different chromosomes
 (3) The genes are tightly linked
 (4) The genes show independent assortment
- 140.** One of the legal methods of birth control is:
 (1) by a premature ejaculation during coitus
 (2) abortion by taking an appropriate medicine
 (3) by abstaining from coitus from day 10 to 17 of the menstrual cycle
 (4) by having coitus at the time of day break
- 141.** Besides paddy fields, cyanobacteria are also found inside vegetative part of :
 (1) *Psilotum* (2) *Pinus*
 (3) *Cycas* (4) *Equisetum*
- 142.** Which of the following are correctly matched with respect to their taxonomic classification ?
 (1) Spiny anteater, sea urchin, sea cucumber – Echinodermata
 (2) Flying fish, cuttlefish, silverfish – Pisces
 (3) Centipede, millipede, spider, scorpion – Insecta
 (4) House fly, butterfly, tsetsefly, silverfish – Insecta
- 143.** Variation in gene frequencies within populations can occur by chance rather than by natural selection. This is referred to as :
 (1) Genetic load
 (2) Genetic flow
 (3) Genetic drift
 (4) Random mating
- 144.** Select the correct match of the digested products in humans given in **column I** with their absorption site and mechanism in **column II**.

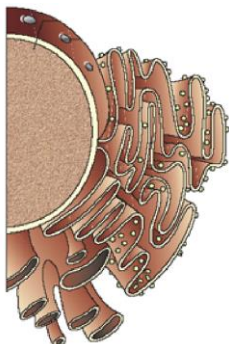
	Column I	Column II
(1)	Cholesterol, maltose	Large intestine, active absorption
(2)	Glycine, glucose	small intestine, active absorption
(3)	Fructose, Na^+	small intestine, passive absorption
(4)	Glycerol, fatty acids	duodenum, move as chylomicrons

- 145.** Select the wrong statement :
 (1) *Chlamydomonas* exhibits both isogamy and anisogamy and *Fucus* shows oogamy
 (2) Isogametes are similar in structure, function and behaviour
 (3) Anisogametes differ either in structure, function or behaviour
 (4) In Oomycetes female gamete is smaller and motile, while male gamete is larger and non-motile
- 146.** Which Mendelism idea is depicted by a cross in which the F_1 generation resembles both the parents ?
 (1) co-dominance
 (2) incomplete dominance
 (3) law of dominance
 (4) inheritance of one gene
- 147.** The diagram given here is the standard ECG of a normal person. The P- wave represents the :



- (1) End of systole
 (2) Contraction of both the atria
 (3) Initiation of the ventricular contraction
 (4) Beginning of the systole
- 148.** Which enzyme/s will be produced in a cell in which there is a nonsense mutation in the lac Y gene ?
 (1) Lactose permease and transacetylase
 (2) β -galactosidase
 (3) Lactose permease
 (4) Transacetylase
- 149.** The most abundant intracellular cation is :
 (1) K^+ (2) Na^+ (3) Ca^{++} (4) H^+
- 150.** Which one of the following is **not** the function of placenta ? It :-
 (1) secretes oxytocin during parturition
 (2) facilitates supply of oxygen and nutrients to embryo
 (3) secretes estrogen
 (4) facilitates removal of carbon dioxide and waste material from embryo

- 151.** In plant breeding programme, the entire collection (of plants/seeds) having all the diverse alleles for all genes in a given crop is called :
- (1) germplasm collection
 - (2) selection of superior recombinants
 - (3) cross - hybridisation among the selected parents.
 - (4) evaluation and selection of parents
- 152.** Which one of the following is **not** a correct statements ?
- (1) Key is taxonomic aid for identification of specimens
 - (2) Herbarium houses dried, pressed and preserved plant specimens
 - (3) Botanical gardens have collection of living plants for reference
 - (4) A museum has collection of photographs of plants and animals
- 153.** Which one of the following organelle in the figure correctly matches with its function ?



- (1) Rough endoplasmic reticulum, protein synthesis
 - (2) Rough endoplasmic reticulum, formation of glycoproteins
 - (3) Golgi apparatus, protein synthesis
 - (4) Golgi apparatus, formation of glycolipids
- 154.** Which of the following represents maximum number of species among global biodiversity?
- (1) Mosses and Ferns
 - (2) Algae
 - (3) Lichens
 - (4) Fungi
- 155.** Which of the following Bt crops is being grown in India by the farmers ?
- (1) Soyabean
 - (2) Maize
 - (3) Cotton
 - (4) Brinjal

- 156.** Read the following statements (A – E) and answer the question which follows them.

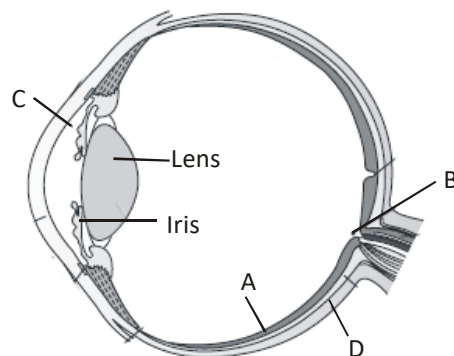
- (A) In liverworts, mosses and ferns gametophytes are free living
 - (B) Gymnosperms and some ferns are heterosporous
 - (C) Sexual reproduction in *Fucus*, *Volvox* and *Allbugo* is oogamous
 - (D) The sporophyte in liverworts is more elaborate than that in mosses
 - (E) Both, *Pinus* and *Marchantia* are dioecious
- How many of the above statements are correct ?

- (1) Four
- (2) One
- (3) Two
- (4) Three

- 157.** The essential chemical components of many coenzymes are :

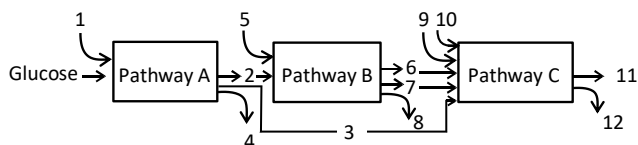
- (1) Vitamins
- (2) Proteins
- (3) Nucleic acids
- (4) Carbohydrates

- 158.** Parts A, B, C and D of the human eye are shown in the diagram. Select the option which gives correct identification along with its functions/characteristics:-



- (1) D- Choroid - its anterior part forms ciliary body
- (2) A - Retina - contains photo receptors-rods and cones
- (3) B - Blind spot - has only a few rods and cones
- (4) C - Aqueous chamber-reflects the light which does not pass through the lens

- 159.** The three boxes in this diagram represent the three major biosynthetic pathways in aerobic respiration. Arrows represent net reactants or products.



Arrow number 4, 8 and 12 can all be :

- (1) FAD^+ or FADH_2
- (2) NADH
- (3) ATP
- (4) H_2O

160. Pigment-containing membranous extensions in some cyanobacteria are :

- (1) Chromatophores
- (2) Heterocysts
- (3) Basal bodies
- (4) Pneumatophores

161. Which one of the following statements is correct?

- (1) Tapetum nourishes the developing pollen
- (2) Hard outer layer of pollen is called intine
- (3) Sporogenous tissue is haploid
- (4) Endothecium produces the microspores

162. The characteristics and an example of a synovial joint in humans is :-

	Characteristics	Examples
(1)	lymph filled between two bones, limited movement	gliding joint between carpals
(2)	fluid cartilage between two bones, limited movements	Knee joint
(3)	fluid filled between two joints, provides cushion	skull bones
(4)	fluid filled synovial cavity between two bones	joint between atlas and axis

163. The Air Prevention and Control of Pollution Act came into force in :

- (1) 1990
- (2) 1975
- (3) 1981
- (4) 1985

164. Product of sexual reproduction generally generates:

- (1) Large biomass
- (2) Longer viability of seeds
- (3) Prolonged dormancy
- (4) New genetic combination leading to variation

165. Among bitter gourd, mustard, brinjal, pumpkin chinaro, lupin, cucumber, sunnhemp, gram, guava, bean, chilli, plum, petunia, tomato, rose, withania, potato, onion, aloe and tulip how many plants have hypogynous flower ?

- (1) Eighteen
- (2) Six
- (3) Ten
- (4) Fifteen

166. A pregnant female delivers a baby who suffers from stunted growth, mental retardation, low intelligence quotient and abnormal skin.

This is the result of :

- (1) Over secretion of pars distalis
- (2) Deficiency of iodine in diet
- (3) Low secretion of growth hormone
- (4) Cancer of the thyroid gland

167. Which of the following is **not** correctly matched for the organism and its cell wall degrading enzyme?

- (1) Fungi – Chitinase
- (2) Bacteria – Lysozyme
- (3) Plant cells – Cellulase
- (4) Algae – Methylase

168. Menstrual flow occurs due to lack of :

- (1) Vasopressin
- (2) Progesteron
- (3) FSH
- (4) Oxytocin

169. Global warming can be controlled by :

- (1) Increasing deforestation, reducing efficiency of energy usage
- (2) Reducing deforestation cutting down use of fossil fuel
- (3) Reducing reforestation, increasing the use of fossil fuel
- (4) Increasing deforestation slowing down the growth human population

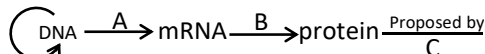
170. Which one of the following is not used for ex situ plant conservation ?

- (1) Botanical Gardens
- (2) Field gene banks
- (3) Seed banks
- (4) Shifting cultivation

171. During sewage treatment, biogases are produced which include :

- (1) hydrogen sulphide, nitrogen, methane
- (2) methane, hydrogen sulphide, carbon dioxide
- (3) methane, oxygen, hydrogen sulphide
- (4) hydrogen sulphide, methane, sulphur dioxide

172. The diagram shows an important concept in the genetic implication of DNA. Fill in the blanks A to C :



- (1) A–translation B–extension C–Rosalind Franklin
- (2) A–transcription B–replication C–James Watson
- (3) A–translation B–transcription C–Erevin Chargaff
- (4) A–transcription B–translation C–Francis Crick

173. DNA fragments generated by the restriction endonucleases in a chemical reaction can be separated by :

- (1) Restriction mapping
- (2) Centrifugation
- (3) Polymerase chain reaction
- (4) Electrophoresis

174. The complex formed by a pair of synapsed homologous chromosomes is called :

- (1) Axoneme
- (2) Equatorial plate
- (3) Kinetochore
- (4) Bivalent

175. The **incorrect** statement with regard to Haemophilia is :

- (1) A single protein involved in the clotting of blood is affected
- (2) It is a sex-linked disease
- (3) It is a recessive disease
- (4) It is a dominant disease

176. Which of the following statements is **correct** in relation to the endocrine system?

- (1) Releasing and inhibitory hormones are produced by the pituitary gland
- (2) Adenohypophysis is under direct neural regulation of the hypothalamus
- (3) Organs in the body like gastrointestinal tract, heart, kidney and liver do not produce any hormones
- (4) Non-nutrient chemicals produced by the body in trace amount that act as intercellular messenger are known as hormones

177. Lenticels are involved in :

- (1) Photosynthesis
- (2) Transpiration
- (3) Gaseous exchange
- (4) Food transport

178. Match the name of the animal (**column I**), with one characteristics (**column II**), and the phylum/class (**column III**) to which it belongs :

	Column I	Column II	Column III
(1)	<i>Adamsia</i>	radially symmetrical	Porifera
(2)	<i>Petromyzon</i>	ectoparasite	Cyclostomata
(3)	<i>Ichthyophis</i>	terrestrial	Reptilia
(4)	<i>Limulus</i>	Body covered by chitinous exoskeleton	Pisces

179. What is the correct sequence of sperm formation?

- (1) Spermatogonia, spermatocyte, spermatid, spermatozoa
- (2) Spermatid, spermatocyte, spermatogonia, spermatozoa
- (3) Spermatogonia, spermatocyte, spermatozoa, spermatid
- (4) Spermatogonia, spermatozoa, spermatocyte, spermatid

180. Macro molecule chitin is :

- (1) Simple polysaccharide
- (2) Nitrogen containing polysaccharide
- (3) Phosphorus containing polysaccharide
- (4) Sulphur containing polysaccharide

ANSWER KEY

NEET(UG)-2013

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	3	2	4	4	2,4	2	4	3	3	2	2	1	3	2	1
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	4	3	3	3	3	4	1	2	3	2	3	3	2	3	2
Que.	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Ans.	1	4	4	4	4	2	2	1	3	1	3	3	2	1	1
Que.	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ans.	4	2	4	3	2	1	3	1	4	3	4	3	3	2	2
Que.	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Ans.	3	2	1	4	4	4	3	4	4	2	4	1	1	4	4
Que.	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
Ans.	3	1	3	3	3	2	4	4	4	3	1	3	1	4	4
Que.	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105
Ans.	4	3	4	4	4	2	2	3	1	2	2	2	1	4	3
Que.	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
Ans.	4	4	4	1	4	4	4	4	3	2	1	3	1	4	2
Que.	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135
Ans.	4	1	2	2	4	3	2	4	2	1	2	3	1	3	4
Que.	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
Ans.	1	2	4	3	2	3	4	3	2	4	1	2	2	1	1
Que.	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165
Ans.	1	4	1	4	3	4	1	2	3	1	1	4	3	4	4
Que.	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
Ans.	2	4	2	2	4	2	4	4	4	4	4	3	2	1	2

HINT - SHEET

1. According to question $n_1\lambda_1 = n_2\lambda_2$
 So $\frac{n_1}{n_2} = \frac{\lambda_2}{\lambda_1} = \frac{10000}{12000} = \frac{5}{6}$
 so minimum n_1 and n_2 are 5 and 6 respectively.

$$X_{\min} = \frac{n_1\lambda_1 D}{d} = \frac{5(12000 \times 10^{-10})(2)}{2 \times 10^{-3}} = 6 \times 10^{-3} \text{ m} = 6 \text{ mm}$$

2. Voltage gain $A_V = \frac{\Delta V_C}{\Delta V_B} = \frac{R_L \Delta I_C}{\Delta V_B} = g_m R_L$

$$\frac{A_{V_1}}{A_{V_2}} = \frac{g_{m_1}}{g_{m_2}} \Rightarrow \frac{G}{A_{V_2}} = \frac{0.03}{0.02} \Rightarrow A_{V_2} = \frac{2}{3} G$$

3. Energy released per u
 $= \left(\frac{0.02866}{4} \right) (931 \text{ MeV}) = 6.675 \text{ MeV}$

4. $PV = nRT \Rightarrow V = \left(\frac{nR}{P} \right) T \Rightarrow \text{slope} = \frac{nR}{P}$

$$\text{As } \theta_2 > \theta_1 \text{ so } \frac{1}{P_2} > \frac{1}{P_1} \Rightarrow P_1 > P_2$$

5. $X = \overline{A.B} = A.B$

6. As block of mass $2m$ moves with constant velocity so net force on it is zero.

8. $X \xrightarrow{\quad} Y \text{ (stable)}$
 $N_x \quad N_y$

$$\frac{N_x}{N_y} = \frac{1}{7} \Rightarrow \frac{N_x}{N_x + N_y} = \frac{N}{N_0} = \frac{1}{8}$$

By using $N = N_0 e^{-\lambda t}$ we have

$$\frac{N_0}{8} = N_0 e^{-\lambda t} \Rightarrow t = 3 \times 20 \text{ years} = 60 \text{ years}$$

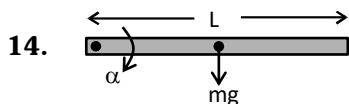
9. $C_P - C_V = R$ and $\gamma = \frac{C_P}{C_V} \Rightarrow C_V = \frac{R}{\gamma - 1}$

10. $\lambda_p = \frac{h}{p} = \frac{hc}{E}$ and $\lambda_e = \frac{h}{p} = \frac{h}{\sqrt{2mE}}$

$$\Rightarrow \lambda_p \propto \lambda_e^2$$

$$11. \left(\frac{\lambda_{\text{Lyman}}}{\lambda_{\text{Balmer}}} \right)_{\text{max}} = \frac{\left(\frac{1}{2^2} - \frac{1}{3^2} \right)}{\left(\frac{1}{1^2} - \frac{1}{2^2} \right)} = \frac{5/36}{3/4} = \frac{5}{27}$$

13. Electric potential decreases in the direction of electric field.



$$14. \tau = I\alpha \Rightarrow mg \left(\frac{L}{2} \right) = \left(\frac{m\ell^2}{3} \right) \alpha \Rightarrow \alpha = \frac{3g}{2L}$$

$$15. R = \frac{\rho \ell}{A} = \frac{\rho \ell^2}{A\ell} \Rightarrow R \propto \ell^2$$

$$17. \text{Change in PE} = -\frac{GMm}{3R} - \left(-\frac{GMm}{R} \right) \\ = \frac{2}{3} \frac{GMm}{R} = \frac{2}{3} mgR$$

$$18. h_1 = \frac{1}{2}g(5)^2, h_2 = \frac{1}{2}g(10)^2$$

$$\text{and } h_3 = \frac{1}{2}g(15)^2$$

$$\Rightarrow h_1 = \frac{h_2}{3} = \frac{h_3}{5}$$

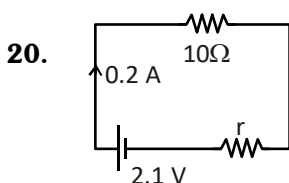
19. Let magnetic pole strength be m then

$$M = m\ell$$

In new situation

$$M' = (m) \left(2r \sin \frac{60^\circ}{2} \right) \text{ where } r \left(\frac{\pi}{3} \right) = \ell$$

$$M' = 2m \left(\frac{2\ell}{\pi} \right) \left(\frac{1}{2} \right) = \frac{3m\ell}{\pi} = \frac{3M}{\pi}$$



$$20. I = \frac{E}{r+R} \Rightarrow 0.2 = \frac{2.1}{r+10} \Rightarrow r = 0.5\Omega$$

$$21. h(2\nu) = h\nu + \frac{1}{2}mv_{\text{max}}^2 \Rightarrow v_{\text{max}} = \sqrt{\frac{2h\nu}{m}}$$

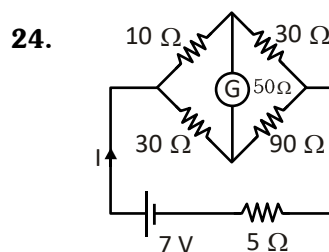
22. $P \propto T^3$ and $PV = nRT$ gives $PV^{3/2} = \text{constant}$

$$\Rightarrow \gamma = \frac{C_p}{C_v} = \frac{3}{2}$$

$$23. Y = \frac{F/A}{\Delta\ell/\ell} \Rightarrow \Delta\ell = \frac{F\ell}{YA} = \frac{F\ell}{Y\pi r^2} \Rightarrow \Delta\ell \propto \frac{\ell}{r^2}$$

Which is maximum

for $\ell = 50 \text{ cm}$ & diameter = 0.5 mm



- 24.

Total resistance of Wheatstone bridge

$$= \frac{(40)(120)}{40+120} = 30\Omega$$

$$\text{Current through cell} = \frac{7V}{(5+30)\Omega} = \frac{1}{5}A = 0.2A$$

25. Number of moles in $1g \text{ He} = \frac{1}{4}$

Amount of heat energy required to raise its temperature from T_1K to T_2K

$$= nC_v \Delta T$$

$$= \left(\frac{1}{4} \right) \left(\frac{3}{2}R \right) (T_2 - T_1)$$

$$= \frac{3}{8} k_B N_A (T_2 - T_1)$$

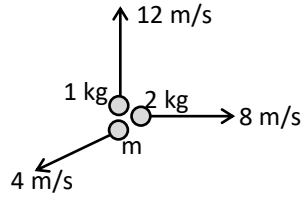
26. We can explain this observation by using $\lambda_m T = b$

Which is Wien's displacement law.

27. Net work done = Area of triangle ABC

$$= \frac{1}{2} \times [(7-2) \times 10^{-3}] [(6-2) \times 10^5] \\ = 1000 J$$

29.



From conservation of momentum

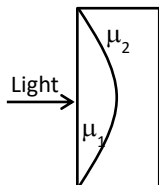
$$m(4) = \sqrt{(1 \times 12)^2 + (2 \times 8)^2} \Rightarrow m = 5 \text{ kg}$$

$$\begin{aligned} 30. \quad P &= \frac{a^3 b^2}{cd} \Rightarrow \frac{\Delta P}{P} = \pm \left(3 \frac{\Delta a}{a} + 2 \frac{\Delta b}{b} + \frac{\Delta c}{c} + \frac{\Delta d}{d} \right) \\ &= \pm (3 \times 1 + 2 \times 2 + 3 + 4) \\ &= \pm 14\% \end{aligned}$$

31. From conservation of mechanical energy

$$\begin{aligned} \frac{1}{2}mv^2 \left(1 + \frac{K^2}{R^2} \right) &= mgh \\ \Rightarrow \frac{1}{2}mv^2 \left(1 + \frac{K^2}{R^2} \right) &= mg \left(\frac{3v^2}{4g} \right) \\ \Rightarrow \frac{K^2}{R^2} &= \frac{1}{2} \Rightarrow \text{The object is disc} \end{aligned}$$

32.



Equivalent focal length is given by $\frac{1}{f_{eq}} = \frac{1}{f_1} + \frac{1}{f_2}$

$$\begin{aligned} \frac{1}{f_{eq}} &= (\mu_1 - 1) \left(\frac{1}{\infty} - \frac{1}{-R} \right) + (\mu_2 - 1) \left(\frac{1}{-R} - \frac{1}{\infty} \right) \\ \Rightarrow f_{eq} &= \frac{R}{\mu_1 - \mu_2} \end{aligned}$$

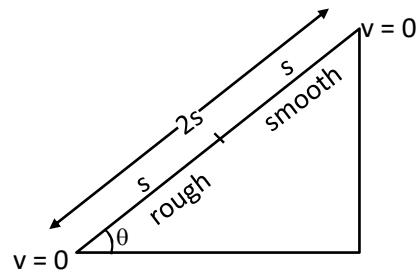
33. As speed of electrons is increased so wavelength of electrons will decrease. Therefore the angular width ($\propto \lambda$) of the central maximum of diffraction pattern will decrease.

34. For a normal eye, rays coming from infinity should go to the retina without effort when we look at infinity, lens offers minimum power and hence combination gives $40D + 20D = 60D$.

Distance between the retina and the cornea eye has must be equal to focal length.

$$f = \frac{1}{60} \text{ m} = 1.67 \text{ cm}$$

35.



From work energy theorem ($W = \Delta KE$)

$$(mg \sin \theta)(2s) - (\mu mg \cos \theta)(s) = 0 - 0$$

$$\Rightarrow \mu = 2 \tan \theta$$

$$36. \quad k = \frac{2\pi}{\lambda} = \frac{2\pi}{2\pi} = 1 \text{ and } \omega = 2\pi f = (2\pi) \left(\frac{1}{\pi} \right) = 2$$

So equation of wave $y = \sin(kx - \omega t) = \sin(x - 2t)$

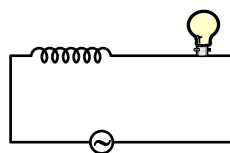
37. Frequency of unknown source = 246 Hz or 254 Hz

Second harmonic of this source = 492 Hz or 508 Hz

Which gives 5 beats per second, when sounded with a source of frequency 513 Hz.

Therefore unknown frequency = 254 Hz

38.

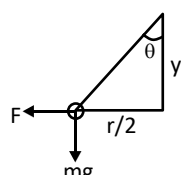


Brightness of the bulb

- decreases when an iron rod is inserted in the coil as impedance of circuit increases.

- increases when frequency of the AC source is decreased as impedance of circuit decreases.
- Increases when number of turns in the coil is reduced as impedance of circuit decreases.
- increases when a capacitance of reactance $X_C = X_L$ is included in the circuit as impedance of circuit decreases.

39.



$$\theta = \frac{F}{mg}$$

$$\Rightarrow \frac{r/2}{y} = \frac{kq^2}{r^2 mg} \Rightarrow y \propto r^3$$

Therefore $\left(\frac{r'}{r}\right)^3 = -\frac{y/2}{y} \Rightarrow r' = r\left(\frac{1}{2}\right)^{1/3}$

40. Pressure change will be minimum at both open ends.

41. Acceleration of charged particle

$$\vec{a} = \frac{q}{m}(\vec{E} + \vec{v} \times \vec{B})$$

Released from rest $\Rightarrow \vec{a} = \frac{q}{m}\vec{E} = a_0$ (west)

$$\Rightarrow \vec{E} = \frac{ma_0}{e} \text{ (west)}$$

when it is projected towards north, acceleration due to magnetic force $= 2a_0$ Therefore magnetic field $= \frac{2ma_0}{ev_0}$ (down)

43. $W = \vec{F} \cdot \vec{S} = (3\hat{i} + \hat{j}) \cdot [(4-2)\hat{i} + (3-0)\hat{j} + (-1-1)\hat{k}]$

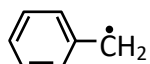
$$= (3\hat{i} + \hat{j}) \cdot (2\hat{i} + 3\hat{j} - 2\hat{k})$$

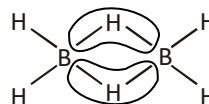
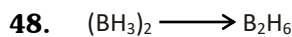
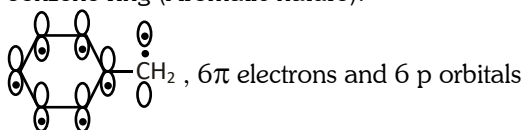
$$= 3(2) + 1(3) + 0(-2) = 9 \text{ J}$$

45. $V = -G(2) \left[\frac{1}{1} + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \dots \right]$

$$= -2G \left[\frac{1}{1-1/2} \right] = -4G$$

46. $\lambda = \frac{C}{\nu} = \frac{3 \times 10^{17} \text{ nms}^{-1}}{6 \times 10^{15} \text{ s}^{-1}} = 50 \text{ nm}$

47.  Benzyl free radical is aromatic as per Huckel's rule it has 6π electrons present in p-orbital of carbon atoms involved in formation of benzene ring (Aromatic nature).



(3 centre-2 e^- bond)
electron deficient

50. $M = \frac{W \times 1000}{M_w \times V_{\text{solution}} (\text{mL})}$

$$2 = \frac{W \times 1000}{63 \times 250}$$

$$W = 31.5 \text{ g}$$

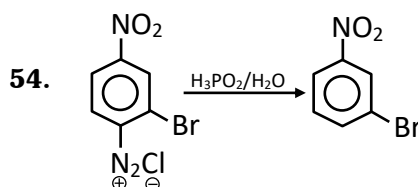
70% HNO_3 means 70g HNO_3 is present in 100g solution.

$$\therefore 31.5 \text{ g } \text{HNO}_3 \text{ will be present in } \frac{100}{70} \times 31.5$$

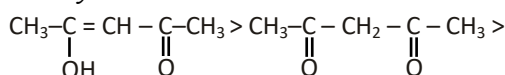
$$= 45 \text{ g of solution}$$

51. diamagnetic – no unpaired e^- present $\text{Yb}^{+2}(70) = [\text{Xe}] 6s^0 4f^{14} 5d^0$ unpaired $e^- = \text{zero}$.

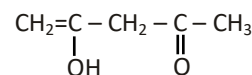
53. Correct answer is (1) for $n = 1$ the electron has more negative energy than it does for $n = 6$ which means that the electron is more strongly bound in the smallest allowed orbit.



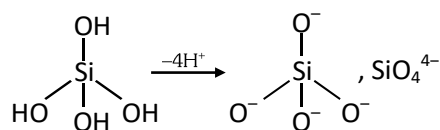
55. Stability order is

Intra molecular H-Bonding and conjugated diene and it has involved more acidic $-\text{H}[-\text{CH}_2-]$

(No conjugated diene)

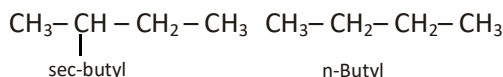
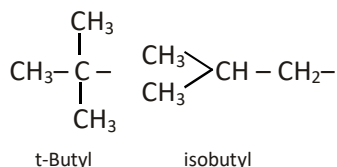
Involvement of less acidic $-\text{H}$ in tautomerism

56. Nylon has polyamide linkage. It is formed by condensation reaction of amines and carboxylic acid groups.

58. Silicates – Salt of silicic acid H_4SiO_4 

silicate ion

60.

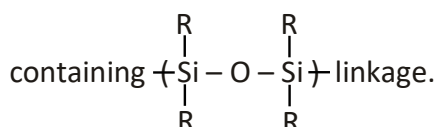


61. In the diamond cubic unit cell, there are eight corner atoms, six face centered atoms and four more atoms inside the structure.

\therefore Number of atoms present in a diamond cubic unit cell
 $= 1 + 3 + 4 = 8$ atoms

63. $n = 3$, $\ell = 1$ and $m = -1$ represent a 3p-orbital so maximum 2 electrons can be accommodated in it.

64. Silicones are organo-silicon polymer containing linkage.



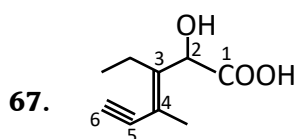
Since Me_3SiCl contains only one Cl therefore it can't form high molecular mass silicon polymer. It acts as a chain terminating organo silane.

65. $\Delta H = (E_a)_f - (E_a)_b$

Given : $(E_a)_f = (E_a)_b$

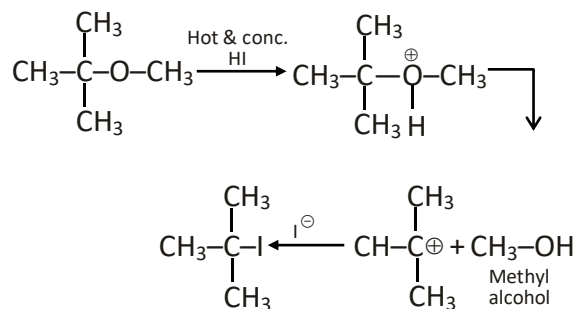
$\therefore \Delta H = 0$

66. $\% \alpha = \frac{\lambda^c}{\lambda^\infty} \times 100 = \frac{9.54}{238} \times 100 = 4.008\%$



3-Ethyl-2-hydroxy-4-methylhex-3-en-5-ynoic acid

68. C-O bond cleavage of ether depends on the mechanism involved in the reaction which can be S_N^1 or S_N^2 . If any one group can form a stable carbocation like a tertiary butyl group then the reaction follows the S_N^1 mechanism.



70. Magnetic moment 1.73 BM

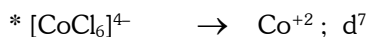
$$\mu = \sqrt{n(n+2)} \text{ B.M.}$$

n = no. of unpaired e^-

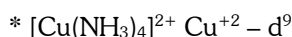
$$\mu = 1.73$$

$$1.73 = \sqrt{n(n+2)} \text{ B.M.}$$

$$n = 1$$



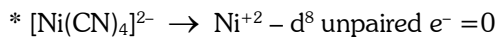
Cl^- (weak field ligand) $t^2g^5e_g^2$ unpaired $e^- = 3$



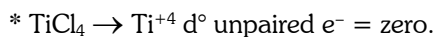
NH_3 Strong field ligand, hybridisation dsp^2

* one e^- of 3d jumps into 4p subshell.

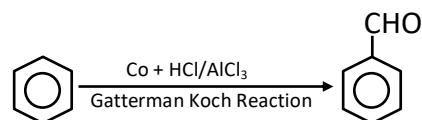
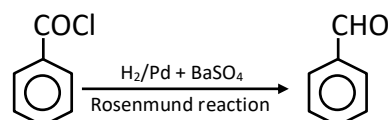
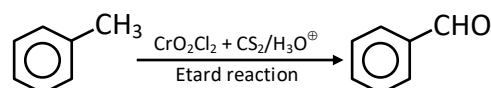
$$\text{unpaired } e^- = 1$$



CN^- - Strong field ligand dsp^2



72. In the presence of Zn - Hg and conc. HCl reduction is useful specially for aldehyde and ketone but a carboxylic group remains unaffected.



73. $(\text{NH}_4)_2\text{Cr}_2\text{O}_7 \xrightarrow{\Delta} \text{N}_2 + \text{Cr}_2\text{O}_3 + 4 \text{H}_2\text{O}$
 does not produce O_2 .

74. $\rho = \frac{Z \times M}{N_A \times a^3}$ for FCC, $Z = 4$

$$a = 404 \text{ pm} = 404 \times 10^{-10} \text{ cm.}$$

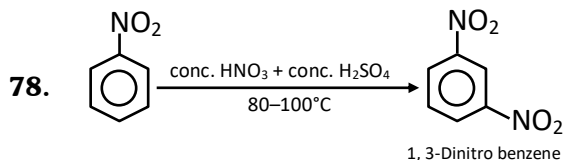
$$2.72 = \frac{4 \times M}{6.02 \times 10^{23} \times (404 \times 10^{-10})^3}$$

$$M = 27 \text{ g mol}^{-1}$$

75. Dipole - induced dipole occurs between polar & Non-polar molecule

HCl	He
Polar	Non-polar
$\mu \neq 0$	$\mu = 0$

77. Deactivating power :



Mixture of [Conc HNO_3 conc H_2SO_4] gives NO_2^+ which acts as electrophile and in nitrobenzene $-\text{NO}_2$ group is m-directing group so NO_2^+ attacks at m-position.

79. $\frac{1}{2} \text{H}_2(\text{g}) \longrightarrow \text{H}^+ + \text{e}^-$

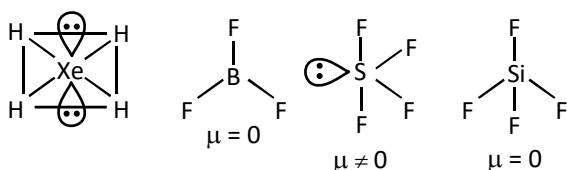
$$E_{\text{O.P.}} = E^\circ_{\text{O.P.}} - \frac{0.059}{n} \log \frac{[\text{H}^+]}{(\text{P}_{\text{H}_2})^{1/2}}$$

$$E_{\text{O.P.}} = 0 - \frac{0.059}{1} \log \frac{10^{-10}}{(1)^{1/2}}$$

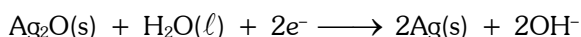
$$(\text{pH} = 10, [\text{H}^+] = 10^{-10} \text{ M})$$

$$E_{\text{O.P.}} = 0.59 \text{ V}$$

80. Unsymmetrical distribution of e^- cloud leads to the formation of polar molecule



81. $\text{Zn}^{2+}(\text{aq}) + 2\text{e}^- \longrightarrow \text{Zn}(\text{s}); E^\circ = -0.76 \text{ V}$



(aq);

$$E^\circ = 0.34 \text{ V}$$

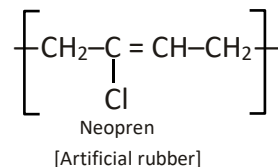
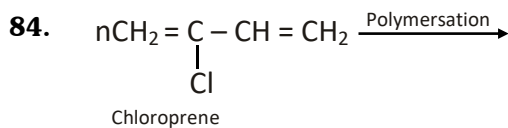


$$E^\circ_{\text{cell}} = (E^\circ_{\text{R.P.}})_{\text{cathode}} - (E^\circ_{\text{R.P.}})_{\text{anode}}$$

$$E^\circ_{\text{cell}} = 0.34 - (-0.76) = 1.10 \text{ V}$$

$$E_{\text{cell}} = E^\circ_{\text{cell}} = 1.10 \text{ V}$$

83. Friedel Crafts reaction fails when strong deactivating group is attached with benzene ring.



85. Number of moles = $\frac{\text{number of molecules}}{N_A}$

$$= \frac{6.02 \times 10^{20}}{6.02 \times 10^{23}} = 10^{-3} \text{ mol}$$

$$\text{Molar conc.} = \frac{n \times 1000}{V_{\text{solution}}(\text{mL})} = \frac{10^{-3} \times 1000}{100}$$

$$\text{Molar conc.} = 0.01 \text{ M}$$

86. NH_3 will show maximum deviation from ideal gas due to dipole-dipole attraction.

87. $\text{O}_2^- \rightarrow 17 \text{ e}^-$ contains one unpaired e^- in ABMO.

$$\sigma 1s^2 \sigma^* 1s^2 \sigma 2s^2 \sigma^* 2s^2 \sigma 2p_z^2 \pi 2p_x^2 = \pi 2p_y^2$$

$$\pi^* 2p_x^2 = \pi^* 2p_y^1$$

89. $\log \frac{K_2}{K_1} = \frac{E_a}{2.303R} \left(\frac{1}{T_1} - \frac{1}{T_2} \right)$

$$\frac{r_2}{r_1} = \frac{K_2}{K_1} = 2$$

$$\Rightarrow \log 2 = \frac{E_a}{2.303 \times 8.314 \times 10^{-3}} \left(\frac{1}{293} - \frac{1}{308} \right)$$

$$\Rightarrow E_a = 34.7 \text{ KJ mol}^{-1}$$